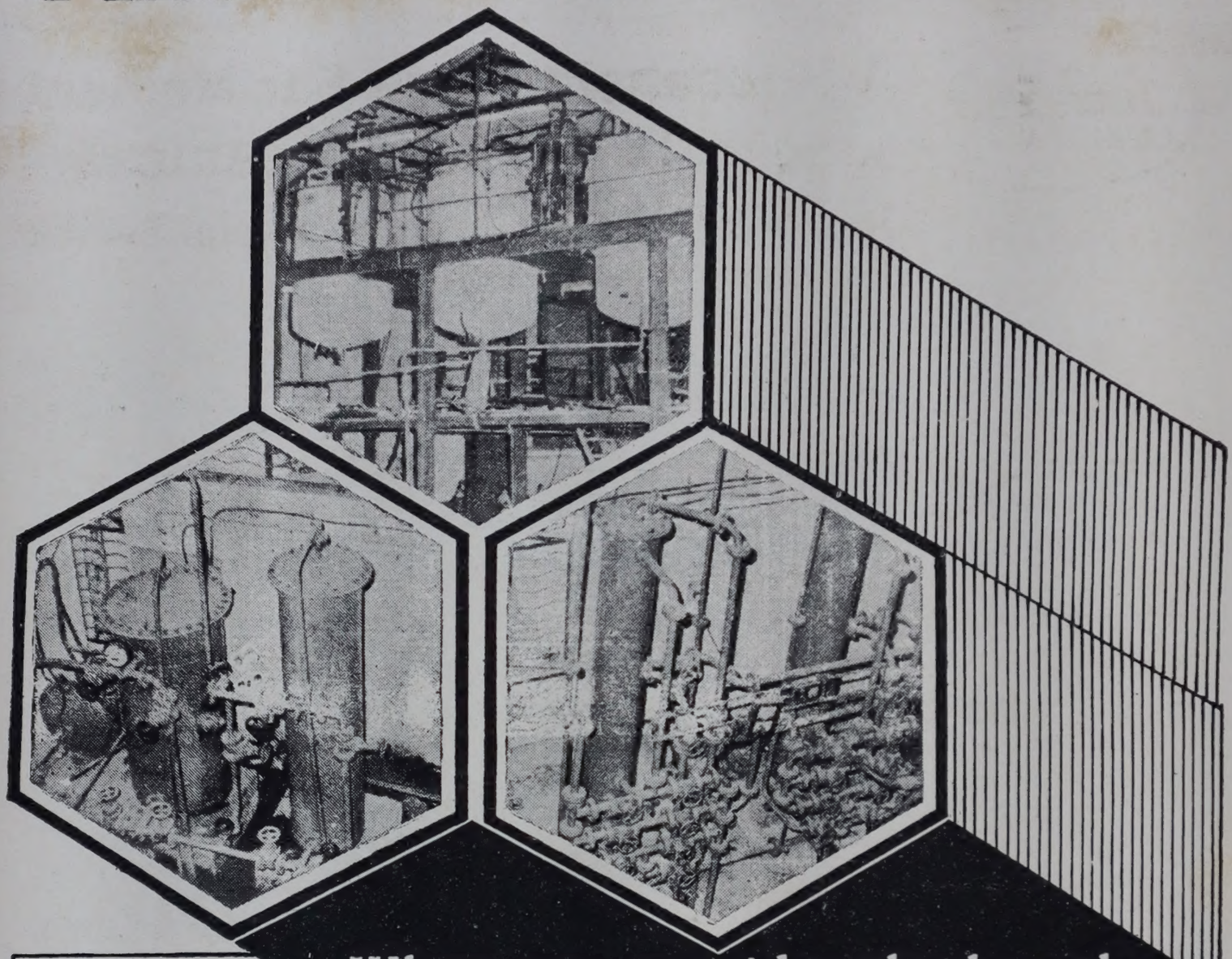
36th YEAR OF PUBLICATION

Chemical Weekly

VOL. XXXVI DECEMBER 11, 1990 NO. 14

PLASTI PIGMENTS PVT. LTD.



When you consider the lengths PPPL goes to give service with good quality, everything it manufactures is surprisingly economical.

Manufacturers of :

Benzoyl Peroxide
Powder & Paste form.
Methyl Ethyl Ketone Peroxide.
Tertiary Butyl Hydro Peroxide.
Tertiary Butyl Per Benzoate.
Di-Tertiary Butyl Peroxide.
Cyclohexanone Peroxide.
M.I.B.K. Peroxide.
Synthetic Pearl Essence
various grades.

NO WONDER B.A.R.C., B.A.S.F. BAKELITE HYLAM LIMITED., ENTRUST THEIR ENTIRE REQUIREMENT OF PEROXIDE CATALYSTS TO PLASTI PIGMENTS

PLASTI PIGMENTS PVT. LTD.
401, SAI CHAMBERS,
365/367, NARSI NATHA STREET,
BOMBAY-400 009.
Tel : 337890-343688

WHERE SERVICE IS A WAY OF LIFE

SEE PAGE 39 FOR CONTENTS

IMPORTED RAW MATERIALS AVAILABLE WITH MODVAT & DUTY DRAW BACK BENEFITS

PHARMACEUTICALS, COSMETICS FOODS

* PROPYLENE GLYCOL U.S.P.
* AEROSIL - 200 N.F.
* P.V.P. K-25/30/90 U.S.P.
  (PLASDONE/KOLLIDONE/POVIDONE)
* ETHYL CELLULOSE N.F.
  N-7, 10, 20/22, 45/50, 200
* METHYL CELLULOSE N.F.
  Grades: CULMINAL-MC 400, 4000 CPS
* HYDROXY ETHYL CELLULOSE
  Grades: NATROSOL 250 LR/GR/MR/HBR
* HYDROXY PROPYL CELLULOSE N.F.
  Grades: KLUCEL EF/LF/GF/HF
* HYDROXY PROPYL METHYL CELLULOSE
  U.S.P.-2910
  METHOCEL/PHARMACOAT/METOLOSE
  METHOCEL E3/E5/E15/E50, E-4M, F-4M
  METHOCEL K-100, K-4M, K-15M
  PHARMACOAT 603, 606, 615
* MICROCRYSTALINE CELLULOSE U.S.P./N.F.
  AVICEL PH 101/PH 102/RC-581/RC-591
* CROSSLINKED NaCMC, U.S.P.
  AC-DI-SOL (TABLET DISINTEGRANT)
* SODIUM STARCH GLYCOLATE U.S.P.
* CROSPOVIDONE U.S.P. (DISINTEGRANT)
  KOLLIDONE CL/POLYPLASDONE XL
* SODIUM CARBOXY METHYL CELLULOSE
  (FOOD/DENTAL/U.S.P. GRADES)
* TITANIUM DIOXIDE U.S.P. (SUPERWHITE)
  ANATASE GRADE - BACTERIA CONTROLLED
* CARBOMER/CARBOPOL 934, 940
* VEE GUM/VEE GUM HV
* XANTHAN GUM
* PARA CHLORO META CRESOL B.P.
  (PREVENTOL CMK - CHLOROCRESOL)
* P.E.G. 400/4000/6000/8000
* POLYPROPYLENE GLYCOL (P.P.G.)
* EUDRAGIT (ALL GRADES)
* DL-LACTIC ACID, 88-92%, U.S.P.
* POLYSORBATE (TWEEN 80) U.S.P.
* VANILLIN/ETHYL VANILLIN
* N-METHYL-2-PYRROLIDONE (NMP)
* TERTIARY BUTYL HYDROQUINONE
  (ANTIOXIDANT - T.B.H.Q.)
* OPADRY
* CELLULOSE ACETATE PHTHALATE U.S.P.
* HYDROXY PROPYL METHYL CELLULOSE
  PHTHALATE U.S.P.
* POLYVINYL ACETATE PHTHALATE U.S.P.

BULK DRUGS INTERMEDIATES

* TETRAHYDROFURAN
* TERTIARY BUTYL AMINE
* N-PROPANOL PURE (Undenatured)
* HYDROXYLAMINE HYDROCHLORIDE
* ADIPIC ACID
* BENZALDEHYDE

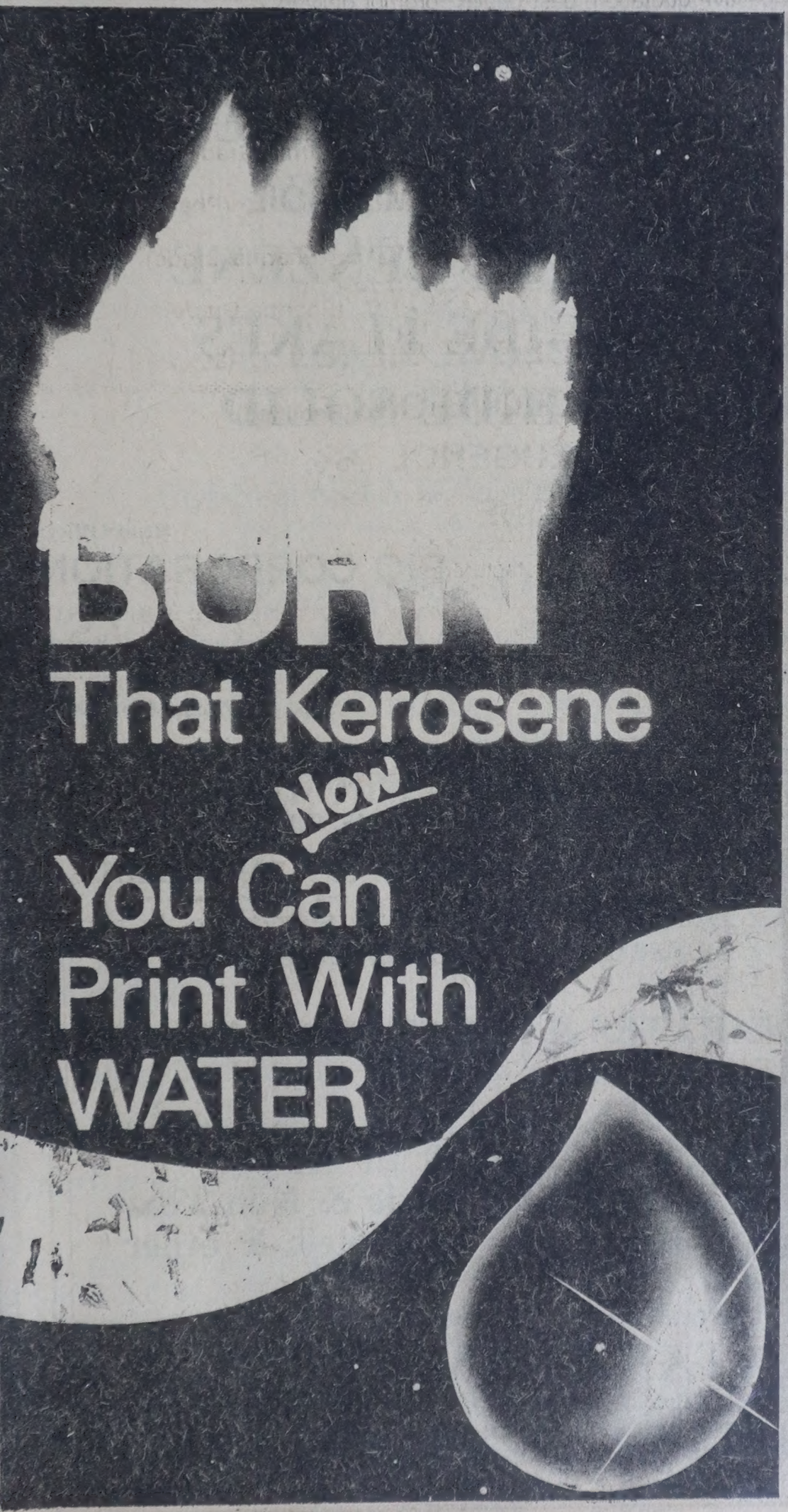
PLEASE CORRESPOND WITH MR. MUKESH KAMDAR / MR. HARISH SHAH
AT

CROWN CHEMICAL PRODUCTS

AT OUR NEW OFFICE ADDRESS

305-B, NEELAM CENTRE, HIND CYCLE ROAD, WORLI, BOMBAY - 400 025

TELEPHONE: OFFICE: 493 7725, 493 7726, 493 7727, 493 4141
RESI: 409 3892, 407 5245, 646 3287
TELEX : 011-73926 CRWN IN
TELEFAX: 2040390



FINE ORGANIC'S ECONOPRINT

is a fully water based pigment printing system.

ECONOPRINT replaces kerosene in pigment printing WITH WATER. Now no more problems of Kerosene permits, storage, fire hazards, air pollution and no rejection, because of kerosene smell in exported goods.

ECONOPRINT eliminates all problems and gives you the better quality of printing on Cotton, Polyester, Nylon or blended fabrics.

ECONOPRINT is not just another acrylic based imported system but it is indigeneously tailor – made to suit Indian process conditions.

If you have already tried out such so called "replacements" which could never replace kerosene, this product is just right for you. Give us a call and we shall make you forget kerosene forever.

FINE ORGANICS

15, NEELKANTH MARKET, 2nd FLOOR,
M.G. ROAD, GHATKOPER (EAST),
BOMBAY-400 077.
PHONE: 5135471/51222/6/5138440/5127047.

Wintoss

M/s. AROMA AGENCIES

(Group Company of M/s. ENGINEERING & CHEMICAL CORPN.)

Are pleased to announce their appointment

as

SOLE DISTRIBUTOR

by

M/s. DIAM ORGANIC CHEMICAL INDUSTRIES PVT. LTD.

Mahad Maharashtra

For their products:

Ethyl Cellosolve (Ethylene Glycol Mono Ethyl Ether)

Ethyl Carbitol (Di Ethylene Glycol Mono Ethyl Ether)

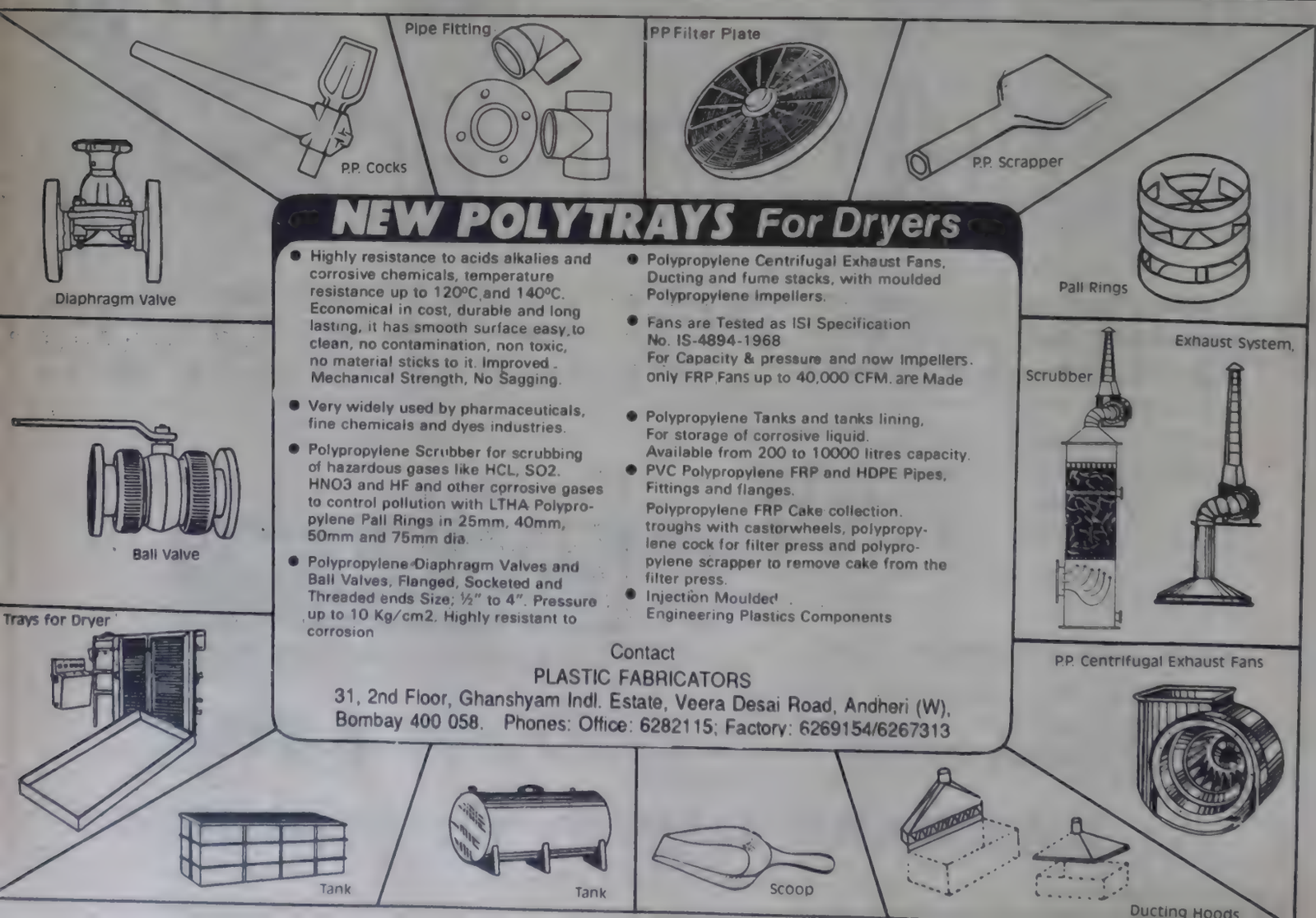
Being offered from ready stock

Please Contact:

AROMA AGENCIES

201, Jyoti Chambers, 372, Narsi Natha Street, Bombay 400 009.

Tele: 33 5051-2-3, 34 2512, 32 5335 Cable: ALCHAGE, Bombay 9. Telex: 011-76524 ROMA IN



NEW POLYTRAYS For Dryers

- Highly resistance to acids alkalies and corrosive chemicals, temperature resistance up to 120°C and 140°C. Economical in cost, durable and long lasting, it has smooth surface easy to clean, no contamination, non toxic, no material sticks to it. Improved Mechanical Strength, No Sagging.
- Very widely used by pharmaceuticals, fine chemicals and dyes industries.
- Polypropylene Scrubber for scrubbing of hazardous gases like HCL, SO2. HNO3 and HF and other corrosive gases to control pollution with LTHA Polypropylene Pall Rings in 25mm, 40mm, 50mm and 75mm dia.
- Polypropylene Diaphragm Valves and Ball Valves, Flanged, Socketed and Threaded ends Size; ½" to 4". Pressure up to 10 Kg/cm2. Highly resistant to corrosion
- Polypropylene Centrifugal Exhaust Fans, Ducting and fume stacks, with moulded Polypropylene Impellers.
- Fans are Tested as ISI Specification No. IS-4894-1968 For Capacity & pressure and now Impellers. only FRP Fans up to 40,000 CFM. are Made
- Polypropylene Tanks and tanks lining, For storage of corrosive liquid. Available from 200 to 10000 litres capacity.
- PVC Polypropylene FRP and HDPE Pipes, Fittings and flanges.
  Polypropylene FRP Cake collection. troughs with castorwheels, polypropylene cock for filter press and polypropylene scrapper to remove cake from the filter press.
- Injection Moulded Engineering Plastics Components

Contact

PLASTIC FABRICATORS

31, 2nd Floor, Ghanshyam Indl. Estate, Veera Desai Road, Andheri (W), Bombay 400 058. Phones: Office: 6282115; Factory: 6269154/6267313

Connected to one of the oldest industries in the world, which incidentally is also the youngest.

From ancient garments made of bark and hide, through historical finds of Chinese silk and Egyptian cotton at burial sites, to modern fabrics made on computerized looms, humankind's relations with clothes are as old as civilization. From the time when lamp-black, powdered lapis lazuli, red ochre, dye secretions of the banded murex snail, indigo and other plant, mineral and animal dyes have been used, human facination with colouring agents is also well known.
We at Texchem continue this oddyssey, this quest for cloth and its colour.

Process chemicals for the textile industry for Sizing, Desizing, Scouring, Mercerising, Dyeing, Printing and Finishing.

TEXCHEM®

TEXCHEM®

182, Dr. Annie Besant Road, Bombay-400 018
Phone: 498 6071, 498 38 18, 498 5782.
Grams: 'Thinqgum', Telex: 75678.

a M.G. Saraf Enterprise
Most trusted name in chemicals.

Chemical Weekly

VOL. XXXVI DECEMBER 11, 1990 NO. 14

Publishers:
SEVAK PUBLICATIONS

ditor - Publisher
. RAGHAVAN

dvertisement Manager
.R. RAJAGOPALAN

dministration/Circulation
IJAY RAGHAVAN

Editorial & Administrative Office:
06, Shri Hanuman Industrial Estate
G.D. Ambekar Road, Wadala,
BOMBAY 400 031.
Phones: 4120743/4131198.
Telex: 011-76053 CWLY IN

Madras Office:
Room No. 9, Wellingdon Estate,
3rd Floor, 24, Commander-in-Chief
Road, Madras 600 105.
Phone: C/o. 471659.
Telex: 041-6290 CWLY IN.

Printed at:
Sevak Publications,
25, North Mada St., Thiruvanmiyur,
Madras 600 041.

Fast Print Service,
307/308, Shri Hanuman Indl. Estate,
G.D. Ambekar Road, Wadala,
Bombay 400 031.

Annual Subscription Rates:
(Inclusive of Postage)
Inland: Rs. 400.00
Foreign: US$ 175.00 (Air Mail)
US$ 75.00 (Sea Mail)

Subscription charges payable in advance in favour of SEVAK PUBLICATIONS

CONTENTS

CHEMICAL WEEKLY

VOL. XXXVI DECEMBER 11, 1990 NO. 14

Are we entering the Green House Century ?

The "greenhouse effect" is a phrase popularly used to describe the increased warming of the earth's surface and lower atmosphere due to increased levels of carbon dioxide and other atmospheric gases that, like the glass panels of a greenhouse, let heat in but prevent some of it from going back out. If it weren't for the greenhouse effect, tehmperatures at the earth's surface today would be some 33°C (60°F) colder than they are, and life as we know it could not exist. Scientists are now debating whether the amount of these "greenhouse gases" will soon be increased by human actions to levels harmful to life on earth. Feared is a rise in temperature of about 5°C (9°F) as early as the middle of the next century — a rate of climate change tens of times faster than the average rate of natural change. How much and how fast temperatures will change and how these changes will alter accustomed patterns of rainfall, drought, growing seasons, sea levels, and so on is controversial. But the greenhouse effect as a scientific proposition is as widely accepted a theory as there is in the earth sciences today.

The Impact on India

The east coast with its lower continental slopes and higher frequency of storms will be more vulnerable to the expected rise in sea level as a result of the predicted global warming. Data collected between 1978 and 1985 shows that the sea level has been rising at one mm a year and that this corresponds roughly to what has been observed in other parts of the world.

The Council of Scientific and Industrial Research has set up a task force of the National Institute of Oceanography, the National Geo-physical Research Institute and the National Physical Laboratory to study the rise in sea level and monitor this closely. Under a UNESCO programme, GLOSS (Global Sea Level Observing System), a network of 297 tide gauge stations are to be set up in the world. Of these 50 will be in the Indian Ocean. Mormugao, Veraval, Cochin, Madras, Visakhapatnam, Port Blair, Nicobar and Minicoy are among the places selected already. The existing network is not considered adequate for monitoring sea level rise as the gauges are not sensitive enough.

Vulnerable Areas: The task force had identified the areas which would be most vulnerable to a rise in the sea level. The Lakshadweep has 27 separate coral reefs and islands and most of them are low lying with the highest points not more than a few metres high. Some are densely populated. The Andaman and Nicobar Islands are higher but would be affected by the increased strength of the storms in the region related to higher sea level.

It has been pointed out that the entire length of the east coast would be far more vulnerable than the western coast. The lower continental slopes and the storms are expected to result in larger areas being submerged by a rise in sea level while the intensity of the storms would further erode the fragile coastline.

In the western coast, the area between 12 degrees North and 18 degrees North latitude would be more stable than the rest of the coast line. This would mean that roughly the coast south of Mangalore and north of Bombay would be more vulnerable.

It is estimated that one-third of the world's population lives within 60 km of the coastline. In the next century 25% of the world population could be affected by the rise in sea level due to global warming. In the last century the sea level rose by 10 to 15 cm. and by 2050 it is expected to rise further by 23 cm to 116 cm.

Estimates vary: The estimates vary because of incomplete understanding of the various factors that would affect sea rise. However, one-third to one-half of the rise in the level of the sea would be due to thermal expansion of water while the rest would be the result of melting of the polar ice caps and general deglacia-

tion. By 2100 the rise in sea level could double from 56 cm. to as much as 345 cm.

The task force has suggested that the effect of rise in the sea level would be three-fold. Some areas would get submerged, there would be an increase in storm surges and these could lead to further damage to the coastline and finally, there would be considerable loss of fresh water aquifers because of salt water intrusion.

Global warming is also expected to lead to vast climatic changes, including changes in the pattern of rainfall. These would affect those countries which are dependent on their agriculture. Scientists are aware that a lot of research needs to be done in this area and the world conference on gobal warming scheduled to be held in Brazil in 1992 will perhaps provide the necessary framework for international cooperation in this field.

There is enough evidence that a global warming has begun which is bound to bring catastrope in the 21st century destroying agriculture and flooding coastal lowlands like Florida in the United States and Bangla Desh in Asia.

However, there are researchers who strongly believe that natural phenomenon like clouds and ocean currents may mitigate the greenhouse effect. So while most experts still believe in their guts that the globe will warm up, they are now less certain that disaster will result. Nearly everyone is worried, but not as worried as two years ago.

The critical questions are how much the earth will warm, and how fast. Right now forecasts for global warming are little more than hunches based on skimpy evidence from a very young branch of science. Computer models estimate that the mean global temperature will rise between 1.8° and 10°F sometime in the next 50 to 100 years — a very broad range of possibilities. A 2° increase in 100 years might be manageable, while 9° over 50 years could raise sea levels and burn out croplands at a disastrous clip. Resolving the debate among climatologists will take a while.

Yet if the uncertainties are great, so are the consequences of misjudgement. Reducing the gases that promote the greenhouse effect could cost trillions — wasted money if the globe isn't warming much after all. But if nobody does anything and the world heats up rapidly, the damage could be incalculable and irreversible.

The facts about global warming are sparse but compelling. Certain gases in the atmosphere, principally water vapour and CO_2, trap heat radiating from th earth's surface. If they did not, the earth's average tem perature would be roughly 0°C instead of just over 59 and everything would be frozen solid. Human activit creates greenhouse gases that include CO_2 (mainl from combustion), methane (from crops and livestock and chlorofluorocarbons, or CFCs (from aerosol spra cans, air conditioners, and refrigerators).

Unquestionably the greenhouse gases mankind is spewing forth are accumulating in the atmosphere. Reg ular measurements of CO_2 taken since the 1950s, fo instance show that concentrations have increased at the rate of about 0.5% per year. James Hansen, a leading expert with NASA's Goddard Institute for Space Studies, estimates that the CO_2 added to the atmosphere since the Industrial Revolution got rolling about 1800 has the heating power of roughly one watt -- equal to a single tiny Christmass tree bulb -- per square meter of the earth's surface. That may not sound like much, but it doesn't take a lot to alter the world as we know it. The global mean temperature at the height of the last ice age 180,000 years go was 51°, just 8° cooler than today.

Add to these facts three pieces of circumstantial evidence and it becomes clear why alarms are sounding: Laboratory analysis of glacial ice as much as 160,000 years old indicates that global temperature and CO_2 levels in the atmosphere do in fact rise and fall together. Temperature readings that are not necessarily reliable suggest that the globe has warmed about 1° in the past 100 years. And the decade of the 1980s was the warmest in this century.

Some of the unanswered questions are most intriguing. Global climate is the product of interactions among many elements. The largest single factor is the oceans, which have 1,000 times more capacity to store heat than the atmosphere. But climate is also affected by land masses, the biosphere (living things), the atmosphere, clouds, glaciers, the sun, the tilt of the earth, and more.

We have had about 10,000 years in our present interglacial, a period the geologists call the Holocene. A number of scientists have suggested that the demise of this interglacial is due and that we will be heading in a thousand years or so back toward the next ice age, a century or two after CO_2 pollution has finally dissolved in the ocean. But the record of the glacial cycles over the past million years suggests that glacial/interglacial cycles follow a sawtooth pattern: ice sheets develop slowly and end rapidly. This sharp recovery then leads to a short interglacial, and the cycle repeats. While some

ents (for example, the Younger Dryas or the Little Ice ge) in climate history do suggest that regional changes ore rapid than 1°-2°C per thousand years have occurd occasionally, it still appears more likely that the slide o the next ice age will take 10,000 years or more. assive glaciers, such as those that built up over anada and Scandinavia in the last ice age, simply annot be constructed in a decade, a century, or even 000 years. At typical Canadian snowfalls of some 1 eter (3 feet) per year, it would take 3,000 years to build ack the great ice sheet to its 3-kilometer height -- and at only if we make the totally unreasonable assumpon that no snow melted in the summer. The cause of e rapid (10,000 year) destruction of the North Amerian and European ice sheets every 100,000 years or o for the past million years is still a matter of debate, nd scientists still aren't sure of the precise physical echanisms of this 100,000 year glacial/interglacial ycle. Whatever the exact cause or causes, it is known at nature can change the climate substantially, that O_2 and methane concentrations in the air seem to ove in concert with temperature trends, and that umans and other living things will be dramatically ffected along the way.

Humans are not simply passengers holding a temorary ticket on planet Earth's ride through the galaxy. We are actively altering the surface of the land and the composition of the atmosphere. These factors affect the natural flows of energy and materials around the planet and in turn are altering the climate. And while it usually akes nature thousands of years to create several degrees of temperature change on a globally sustained basis, human beings can do so in a century or less.

Those who argue against the Green House effect efer to the case of Missing CO_2.

The finite quantity of carbon on earth is recycled hrough the atmosphere, water and living things. Plants, or instance, take carbon dioxide from the atmosphere, break it apart, give off the oxygen, and use the carbon o build new cells and grow. When plants die and decay, CO_2 is formed and passes into the air or water. Fossil fuels like coal and oil constitute a huge store of carbon that was taken out of the cycle millions of years ago when the vegetation that created them became trapped in the earth.

Man is putting that carbon back into circulation by burning fossil fuels. Using a rough estimate of how much fossil fuel the modern world has consumed, scientists have calculated how much CO_2 has been released into the atmosphere by the process. But when they analyse the atmosphere, they find only half the predicted amount.

At a recent hearing held by the National Academy of Sciences' policy committee, James Hansen was asked where the carbon went. "We're not really sure," he replied. "There must be a carbon sink somewhere. Maybe it's the northern forest." Translation: Something big is absorbing carbon —may be all those trees in Canada and Scandinavia and the U.S.S.R. But for forests to soak up half the CO_2 produced, the trees would have to be either bigger or more numerous than they were before the Industrial Revolution. A spokesman for the American Forestry Association says no evidence indicates that has happened. May be the mysterious sink is something in the oceans, which contain 55 times as much carbon as the atmosphere and 20 times more than plants.

Nor were the experts able to tell the NAS hearing what causes CO_2 levels to rise and fall with temperature through time, as evidenced by those samples of glacial ice. Clearly some natural force or forces can move CO_2 levels up and down independently of man. No one knows what they are — or what they are up to right now.

One fascinating aspect of the cloud question: Scientists have discovered that sulphur dioxide, a pollutant from smokestacks that is blamed for acid rain, also causes clouds to form. That might explain why many industrial regions of the Earth have not warmed up as much in the past century as the computer climate models say they should have. And it raises the possibility that if the U.S. scrubs sulphur from smokestack emissions, the air will be not only cleaner but hotter as well.

Says Ned Ostenso, an assistant administrator of the National Oceanic and Atmospheric Administration: "Our knowledge of the global system is still pretty rudimentary, but we're learning that it's made up of wheels within wheels within wheels."

No one knows how these feedbacks will add up, and that has led to some sharp exchanges between the alarmists and the skeptics among climatologists. One prominent skeptic, Richard Lindzen, a Professor of meteorology at MIT, recently suggested that in certain climes global warming might decrease the amount of water vapour in the upper atmosphere, which would have a cooling effect. Alarmists scoff at Lindzen's suggestion, arguing that water vapour will increase in the lower atmosphere — with the opposite result.

With uncertainties like these, it is perhaps not sur-

prising that sometimes the alarmists can be hard to tell from the skeptics. Lindzen says his hunch is that the globe will warm between 1° and 2° in the next century. One of his chief antagonists, Stephen Schneider of the National Center for Atmospheric Research in Boulder, Colorado, says he's 90% sure of at least that much warming. NASA's Hansen, who stunned Congress in 1988 by suggesting that global warming had begun, says he is more optimistic today that the worst-case scenario won't come to pass. Still, he adds, "We could be building a time bomb for ourselves."

The CBO estimates that the charges needed just to keep the CO_2 emissiion rate where it is would come to $17 for a ton of coal, which now costs $ 30, and 8.6 cents per gallon of gasoline. A study by the Electric Power Research Institute, an US industry R&D organisation estimates that after discounting to present value, the cost to the U.S. economy of cutting CO_2 emissions 20% would be $800 billion to $3.6 trillion over the next century. The lower estimate assumes growing use of clean energy at a price competitive with coal. Such a technology exists: nuclear power.

Roger Sedjo of Resources for the Future, a research center in Washington, D.C., estimates that planting 1.1 billion acres of new forest, roughly equivalent to the area of the contiguous states west of the Mississippi, would soak up all 2.9 billion tonnes of carbon that gets added to the atmosphere each year. Says Sedjo: "We are talking big numbers, increasing the world's forests by some 16% at a cost of may be $500 billion. But if this is an emergency and it's paid for out of a global checkbook, it can be done.

Business can do a number of things that make sen in their own right and also help limit global warmir Pacific Gas & Electric is building a $10 million resear center to look for ways to save energy in lighting. I Pont, among others, is at work on substitutes for CFC which deplete the ozone layer. Weyerhaeuser is dev oping loblolly pines that get by with little water. Tre also help conserve energy: Lawrence Berkeley Labo atories and the American Forestry Association estima that the shade produced by 100 million trees planted empty spaces in suburban and commercial neighbou hoods around the country could save $4 billion a ye in air conditioning bills.

One creative new product comes from Ben & Jerry Homemade Inc. The Vermont gourmet ice cream mak is mixing a new flavour called Rain Forest Crunch th contains Brazil nuts harvested from the wilds of th Amazon jungle. Since carbon dioxide entering th atmosphere as a result of deforestation accounts fo roughly 20% of the worldwide annual build up of CO Ben & Jerry's figures that creating demand for nuts migh save the trees from the settler's axe — and help cur global warming.

Think of the salve to your conscience next time yo happen on some Rain Forest Crunch. Eat all you want Save a tree.

— T.P.S. RAJAN

(Souce: Peter Nulty in *Fortune*, April 9, 1990 and 'Goba Warming' by Stephen Schneider.

CHEMARENA

L. VENKITESWARAN

Kemira's novel pulping process

Kemira of Finland claim to have a new process for pulp- without the use of chlorine or sulphur dioxide. The pro- ss is successful in 100 kg. batches and is expected to be aled up. The active agent is formic acid for pulping and eaching with hydrogen peroxide follows. The pulping is id to be at only 100°C and under atmospheric pressure but ecovery cycle for formic acid is essential and perhaps not lly developed.

The bleaching is with alkaline hydrogen peroxide. The process is workable only on hard woods and the residues from "black" liquor after removal and recovery of formic acid may go for concentration and fuel use. It is not clear if the lignin component is fit for any use other than as fuel. It is to be seen if their approach could be better than the alcoholic caustic digestion which claims recovery of lignin in usable form and also the pentosans as pentoses.

Olefines by Dehydrogenation

The new era of dehydrogenation of the saturated short chain iphatics to the olefines has begun with the propane to pro- ylene technology first offered by UOP. This is a move away om steam cracking of naphtha to catalytic dehydrogenation nder milder conditions to specific olefines instead of the iverse products from steam cracking. Apart from the chang- g scenarios in the petroleum products the huge investments n a multiproduct complexes is avoided. Refineries have been ble to provide propylene and butylenes from the FCCs which re an essential part when light and middle distillates have o be increased from the heavier fractions. US is probably ne only country with large source of propylene from refin- ries in excess of 40% of the requirements. US also gets most f its ethylene from natural gas and share of naphtha crack- ng is low. Now better catalyst are being developed for FCC o that proportion of propylene is higher than of C_4^+ to meet ne reduced needs of the latter so as to meet the reduced RVP pecification for gasoline. Europe has a potential for nearly million tonnes of propylene from refineries but there is not nuch of recovery.

Natural gas may have varying content of propane/butane nd depending on the operations propane or C_3/C_4 mix can e separated as condensate for direct fuel use (as in India) r for chemical feedstock. Saudi Arabia had concentrated on thane to ethylene and downstream products and only recently urned to propane.

UOP offered the first dehydrogenation process for pro- ane -- Oleflex -- and the first plant is said to be operating n Thailand. There are a reported 14 more such plants under construction/finalisation in S. Korea, Malaysia, Saudi Arabia nd numerous other places. Others also offer dehydrogena- technology for propane now -- Phillips Petroleum -- with their Steam Assited Active Reforming or STAR and more importantly Houdry with their Catofin technology. North Sea Petrochemicals in Antwerp with capacity of 250,000 MTA and a Mexican plant of 350,000 MTA are to be based on Catofin. Stone and Webster claim to have developed their fluid bed QC (Quick Contact) designs for propane dehydrogenation as well. The latest offer of technology is from Linde of Germany who have completed all trials in a semi-commercial plant at BASF, Ludwigshafen. Linde claim lower costs, and higher yields though no published data are available. It is said the hydrogen dilution used in UOP's Oleflex and vacuum conditions as with Catofin are avoided.

Isobutane cracking (with steam) to isobutylene and propylene has been employed where MTBE was to be the major product. Butane cracking as well as catalytic dehydrogenation to olefines and butadiene have been operated for years but discontinued when naphtha cracker gave these at lower costs. The situation may change. Much depends on the price ratio of C_2 to C_3 olefins and of ethylene to butadiene and relative prices of naphtha and LNG. There is bound to be a greater shift to dehydrogenation for olefines, propylene in particular and of butanes to a lesser extent. Process for ethane dehydrogenation are on the horizon and may emerge in the late nineties. More likely entrants to the field are Foster Wheeler of US and KTI of Holland and perhaps Lurgi.

We may see the end of new naphtha steam cracking capacity as "mother" plants for petrochemicals before the end of this decade. India's plans for naphtha cracking for Haldia have now firmed up and several others for which nominal approvals were granted include for one in Assam. Propane to propylene and ethane (C_2/C_3) to ethylene are finalised for Hazira & Auriya.

Celmex of Mexico's big plans

American Celanese established a joint venture with Mexican partners for petrochemicals and synthetic fibres and this firm Celmex has progressed far in the last 2 decades. With the sell out of American Celanese to Hoechst of Germany the latter are the successors to the 40% equity of Celmex who report sales of $700 million last year. Cellulose acetate for cigarette filter has been a big item with production of 20,000 tpa and now to be expanded by 50%. Polyester was a top produce of American Celanese and Celmex has a reported 132,000 tpa of staple and yarn. Nylon fibres are a modest 36,000 tpa. The fibres operations are being modernised.

Celmex is the major purchaser of acetaldehyde from ethylene of the State-owned Pemex which has a monopoly on primary petrochemicals. Acetic acid, acetic anhydride, vinyl acetate and 2-ethyl hexanol are the main derivatives from acetaldehyde and capacities have steadily been expanded and now are reported to be:

Acetic acid	1,82,000 tpa
Acetic anhydride	90,000 tpa
Vinyl acetate	61,000 tpa
2-Ethyl hexanol	70,000 tpa

The interesting point is that the VAM production uses t original Celanese process using acetaldehyde and ace anhydride and Celmex have reached a stage in which th process is not economic for the level of production now ar the ethylene based process is to be installed for 75,000 t capacity by 1991 at a cost of $150 million. The acetic ac consumption for VAM will be nearly the same but most o the acetic anhydride will be surplus. India's VOCL have take up this Celanese process and operating successfully in a full integrated plant of 15,000-20,000 tpa of VAM and they wi be the only user of this technology which competes well wit ethylene process of 10,000 tpa in India.

Celmex plans to invest $700 million over five years an take up acrylic acid and esters also. The production of 2-ethy hexanol will presumably continue to be based on acetaldehyd as there is no oxo-process programme in the projections.

Wastes yield useful chemicals

Du Pont have been successful in recovering useful chemicals from the wastes of their large nylon 66 operations. This recovery schemes have been worked out over a period of 3 years and the wastes which were being destroyed at considerable expense are now a source of useful revenue. Isobutyl ester of adipic acid is one of these and finds use as a solvent. Another by-product of the nylon complex is 2-pentane nitrile which is found useful for resins. Benzoic acid and phthalic acids also arise as byproduct's in the oxidation of para-xylene and are being recovered. Acetonitrile by product of the acrylonitrile process is being worked up to useful derivatives while methyl glutaro nitrile (MGN) is recovered from the adiponitrile process (of the Nylon complex). This MGN is hydrogenated using special catalysts to the amine which finds application for urethanes. One of the primary needs has been to identify customers, enduse for a by-product which could be recovered and then to develop recovery process to get the required purity or a conversion process where required.

It is reported that Du Pont expect sales of such by-products or derivatives from wastes to the extent of $250 million by 1996 and incidentally save $ 100 million in costs for disposal.

Calcium Carbide Chemistry

Calcium carbide and acetylene derived from it were the links between inorganic and organic chemicals in the early years. Germany depended very much on such acetylene as base for chemicals which they could not get from outside sources during the war years and post war era, "Reppe Chemistry" was the buzzword of that era and acetaldehyde and ethylene were derived from acetylene and these served for the large group of downstream chemicals and polymers.

The petrochemical era took over and totally displaced the acetylene era for organic chemicals except for some special items (chloroderivatives including vinyl chloride), acetylene black, etc. Chemische Werke Huls specialised in making acetylene from natural gas through an electric discharge furnace and continued for several years. But acetylene from calcium carbide continued in East Germany and South Africa as the base for acetaldehyde. South Africa may soon be able to get ethylene from syngas derived from coal in their mammoth coal to liquid fuel plants. India still uses calcium carbide as a source of acetylene for PVC (also chloro solvents where use of acetylene is logical).

Now the reunification of Germany spells the end of calcium carbide era at Schkopau in former East Germany. It is reported that the present capacity of nearly a million tonnes will be phased out in 2 to 3 years. Feedstocks (ethylene?) will be available from former West Germany sources and CW Huls is joining as a partner. One of the main use of acetylene was for acetaldehyde and this will be made from ethylene to link up with the derivatives plants

O.P. KHARBANDA

FRANKLY SPEAKING

Dr. O.P. KHARBANDA, Cost & Management Consultant,
501, Olympus, Altamount Road, Bombay 400 026.
Phone: 91-22-362728 Telex: 11-5214 Fax: 91-22-2864091

Volvo — Teams Make Assembly Line Obsolete

Henry Ford revolutionised car manufacture in 1914 with the introduction of assembly line concept replacing the teams approach. History is now repeating itself with teams replacing the assembly line at Volvo's new plant at Uddevalla in south-west Sweden, and this has been widely acclaimed as a breakthrough (Robert Taylor: 'Why Volvo is planning to go back to the future', Finl. Times, London, June 9, 1989) and may well become the forerunner of future auto factories. Roger Holtback, Volvo's car division president states:

> We are saying farewell to the traditional assembly line...I hope that one day in the future somebody will be able to stand here and say 'Henry Ford invented the assembly line but Volvo did away with it — in a profitable way'....(after all) it is people who create quality, not technology alone. A robot does a good job only if correctly programmed by humans.

In effect, Volvo is questioning the fundamental assumption behind mass production based on simple, repetitive and unskilled tasks performed under strict time-and-motion controls, but in the process we seem to have lost the 'holistic' view of production. Interestingly, Volvo took to assembly line operation rather late, in 1953 though the company was established as early as 1926. In the 60's, company faced high absenteeism, also high labour turnover, with low productivity. In its efforts to make the work more varied, interesting and attractive, the company based its Kalmar plant on a work-team basis with computer guided carriers bringing components to the decentralised assembly points. Absenteeism (about 8%, less than half of that at the traditional assembly line plant in Gothenberg) and labour turnover declined and productivity soared. Uddevalla is a much improved version of Kalmar and seeks to enhance the role of the car worker to that of craftsman of the last century — even with well proven though antiquated systems of apprentice and master craftsman. Of course, full use is also being made of high technology in engineering and computer sciences. Workers are grouped in teams of 8-10 in six product plants, the teams are autonomous and responsible for assembly of the complete car, including quality control.

In 1989, the plant achieved its production target of 10,000 cars, breakeven expected in 1990 and the full capacity of 40,000 likely to be reached by 1991. About 40% of the workers are women, assembly is done in a stationary position, not moving lines, special hand tools, ergonomically designed for women, are being used. The noise level is low, natural light and stress-free colour designs on the walls, and there is a conspicuous lack of dirt and smell. The production level for the day is decided by the team itself, co-ordinator is chosen in rotation, and most of the work is carried out by workers standing upright, thanks to a specially designed device which can tilt the car body by as much as 90 degrees. More power is continuously being delegated down the line, thereby posing more challenges to the workers and also encouraging creativity. Training is very elaborate, with a 16-week initiation programme as part of a 16-month development programme. Planning and design was a co-operative effort between the union and the management, operation is on a consensus basis with no supervisors or foremen. Workers and union officials are as enthusiastic as the management and industrial democracy seems to be a reality. Elsewhere in the world, the trend is to use cheap, unskilled labour in the Third World countries to build volume via assembly line operations, but Volvo is convinced that there will always be a market for high quality hand-made cars built in a humane way to the latest environmental standards. On the whole a most commendable effort, which is being keenly watched by entrepreneurs, social scientists and others all over the world.

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of repute. His recent title: WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY (Gower 1990); PROJECT TEAMS — THE HUMAN ELEMENT (Blackwell/NCC & Company, 1990); and COMPANY CULTURE — IT'S ROLE IN AN INDUSTRIALISED SOCIETY (Mcbuny Press, 1990). Available from Vivek Enterprises, 5 S.K. Barodawalla Marg, Bombay 400 026.

PETROCHEM UNIT IN ORISSA

Thapars sign MoU with Soviet company

The Thapar group is planning to set up a Rs. 2,650 crore joint sector petrochemical project in Orissa. The naphtha cracker project to be put up in either of the port towns of Paradeep or Gopalpur will have a capacity of 3,30,000 mtpa. The group signed a meomrandum of understanding (MoU) with the state government and 'MGO' technochim of the USSR for import of technology from the Soviet Union under the terms of Indo-USSR bilateral rupee trade agreement. The import of equipment is, therefore to be done on rupee trade.

The whole project, according to informed sources, is to be totally foreign exchange neutral. The unit, which will manufacture low density polyethylene (LDPE), high density polyethylene (HDPE), polypropylene and polystyrene, will have an equity base of Rs. 662.5 crores out of which foreign holding will be Rs. 132.5 crores and the remaining with the Indian promoters, namely the Orissa Government and the Thapars. The rest of the amount is to be raised through public issues.

The MoU also says that the financing of the project by the Soviets will be on deferred payment basis and at a low interest rate. The feedstock, naphtha, for the project will be imported for about five to six years till the proposed Indian oil refinery comes up at Daitari, according to sources. During the first five years of commercial production, the project is expected to meet its foreign exchange requirements by way of export of products from downstream units to USSR and other countries. The State Government also plans to support the project with a number of downstream units, sources said.

As a means of backward integration, the Soviet collaborators have also agreed, in principle, to consider the possibility of setting up an oil refinery in the State. The Soviet collaborators have also visited the two sites and have approved both, according to sources. This will be the second petrochemical project in the East with the other one coming up at Haldia.

DGTD has accepted the proposal and has said that while in the past several applications have been rejected for not having a definite tie-up for ethylene this application could, however, be taken up by the licensing committee for review. According to DGTD figures, the gap in capacity of LDPE/LLDPE and HDPE by 1994-95 are 1,18,184 tonnes and 2,45,000 tonnes, respectively.

DOCK THEFTS PARALYSE BULK DRUG UNITS

The importers and exporters of bulk drugs have suffered a loss of about Rs. 2 crores in the last three months owing to thefts and pilferage in the city dock, according to Mr. K.D. Vora, President, Small Scale Industry Bulk Drugs Manufacturers' Association. The association, which has over 60 members, says in a press release that a consignment to the Soviet Union, worth Rs. 50 lakhs packed in a container, was found missing resulting in huge loss to insurance company and the Indian party.

The insurance company had to pay for the loss in valuable foreign exchange. Such thefts tarnish the image of the country besides putting the Indian party in an embarassing situation, says Mr. Umed Doshi, a bulk drug manufacturer. Mr. Vora cited another example recently in which case 80 drums of ampicillin and 125 drums of amoxycillin valued at Rs. 1.25 crores have been stolen from the docks. The increasing incidence of thefts has virtually paralysed importers and exporters of bulk drugs. Besides, Mr. Vora says insurance companies are reluctant to cover insurance and demand very high rate of premium. When the country is in dire need of earning foreign exchange in the current context of ever-increasing petroleum prices, the enforcement authorities should see that strict measures are enforced to prevent thefts in the dock adds Mr. Vora. The Association President had already met the Additional Commissioner of Police, Mr. S.S Suradkar, who had assured speedy action. He adds in the press release that situation at the docks would restore to normalcy as it did during the tenure of Mrs. Meera Borwankar as DSP.

EXCISE DUTY ON CAUSTIC REVISED

Effective 1st November 1990, the Basic Excise Duty on caustic soda lye supplies will be Rs. 1,300 per tonne. On this, Special Excise Duty will be 5%. In other words, the total Excise Duty stands revised to Rs. 1,365 per tonne.

FAI AWARD FOR ZUARI AGRO CHEM.

Zuari Agro Chemicals Ltd. a Goa based company, has won the FAI award for the best performance in environment protection among nitrogenous fertiliser plants in the country during the current year. The award has been instituted by the Fertiliser Association of India to recognise and honour excellence in environment protection.

ORTHOXYLENE IMPORT UNDER OGL URGED

The manufacturers of phthalic anhydride have urged the Government to issue a notification immediately to include orthoxylene in Appendix 6 - list No. 8 - Part I of the import and export policy to enable them to import orthoxylene under open general licence. Orthoxylene is the only raw material for the manufacutre of phthalic anhydride which in turn is an essential intermediate for dyes, dyes intermediates, paints pigments, plastics, plasticizers, printing ink and synthetic resins, etc.

Herdillia proposal rejected

ne proposal of Herdillia Chemicals for the manufacture of ethy- oxide and ethylene glycols at vah district in UP has been turned n by the govt. The Rs. 270-crore ect was proposed with a capacity of 00 metric tonnes of ethylene oxide one lakh metric tonnes of ethylene ol at a location called Auraiya. The ect cost was to have been met by of equity of Rs. 90 crores, rupee s from financial institutions for 156 crores and foreign exchange s of Rs. 24 crores. The rejection has n issued on the ground that the com- y had not tied up for its feedstock. present IPCL, NOCIL and India col are the major manufacturers of products. IPCL has an installed acity of 20,000 tonnes per annum. ere is also a proposal to make 5000 nes per annum of ethylene oxide and 000 tonnes per annum of ethylene col from the Maharashtra Gas acker Plant.

Reliance and SM Dyechem are also ng in for ethylene glycol with a acity of 5,000 tonnes per annum. eanwhile the government has proved the company's move to shift manufacturing activity for the pro- ction of isophorone from a centrally ckward area to its existing undertak- at the MIDC's Thane creek indu- al area, (both in Maharashtra) in axation of the location policy.

Simultaneously the company has also odified the scheme of finance for ancing the project consequent to its cision to split the location in respect the above products and the other ms like metaxylenol and trimethyl enolin, to be produced in a backward ea. Initially, when all these products ere to be produced under the substan- l expansion scheme with lower capac- s the cost estimate was Rs. 375 lakhs ly for a capacity of 600 tonnes per num of isophorone, 300 TPA of taxylenol and 40 TPA of trimethyl enol.

But subsequently, the company has decided to implement the isophorone item with higher capacity in one location and the other two products at a different place, necessitating revision in the total project cost at Rs. 1,000 lakhs. The revised cost will be met through internal accruals (Rs. 200 lakhs), rupee loans (Rs. 400 lakhs) and debentures (Rs. 400 lakhs). In the earlier scheme, the company had proposed to raise Rs. 375 lakhs from its internal accruals, which will now be only Rs. 200 lakhs.

Herdillia Chemicals suffered a setback in is six months working ended September 1990. The results of the previous half-year and the current half year are not strictly comparable in view of the loss of revenue and profit in the current year due to the temporary shutdown of the phthalic anhydride and cumene/phenol plant. Overall results for the full year are expected to be satisfactory.

Total income during the period amounted to Rs. 47.35 crores against Rs. 56.13 crores same period last year and Rs. 112.80 crores last year. It has earned a lower gross profit of Rs. 554 lakhs against Rs. 819 lakhs and Rs. 1,548 lakhs for whole of last year. After depreciation (Rs. 120 lakhs against Rs. 115 lakhs) and taxation (Rs. 174 lakhs against Rs. 282 lakhs), the net profit amounted to Rs. 260 lakhs against Rs. 422 lakhs and Rs. 735 lakhs last year.

Other income includes 'accrued income' of Rs. 376 lakhs towards part of company's claim for loss of profit. Final settlement of claim is expected before March 1991. Amongst the new projects, Herdillia Oxides and Electronics Ltd. has commenced trial production in November 1990. Orders have been placed by Herdillia Unimers Ltd. for the major foreign and local long delivery equipment. The civil work in respect of Herdillia Polymers is expected to commence by the end of this year.

Gulf crisis hits sulphur imports

The present Gulf crisis has thrown India's buying schedules for sulphur out of gear. Supplies in the international markets have dwindled sharply, while prices have shotup by about 10 to 15 per cent. Sulphur is a vital raw material in the manufacture of phosphatic fertilisers. The country imports approximately 18 lakh tonnes of sulphur every year, valued at around Rs. 320 crores.

The Gulf countries of Saudi Arabia, Kuwait, Iraq and Iran supply around 60 per cent of India's requirements. Supplies out of Kuwait and Iraq, which usually despatch four lakh tonnes of sulphur to India yearly (approximately 25 per cent of all requirements) have been completely shut off. Around four lakh tonnes are bought from Canada and the U.S. while anywhere between 2.5 and 3 lakh tonnes of sulphur come from Poland.

To make matters worse, supplies from Saudi Arabia are scarce. To help out its friends, Saudi Arabia has already committed supplies of one lakh tonnes each to Egypt and Morocco while Tunisia will receive a whoppping half-a-million tonnes. After meeting these obligations, there will be little left to offer to other buyers in the international markets. Meanwhile, out of the total scheduled imports of 18 lakh tonnes, the quantity imported during the period April-December this year is 13.50 lakh tonnes, which is one lakh tonnes short of the target. The shortfall is because import of one lakh tonnes of sulphur from Iraq and Kuwait remained unrealised.

Efforts are now on to persuade Poland to supply one lakh tonnes in January, though this is an uncetain prospect given the changing socio-political conditions there. Individual suppliers in Poland are now capable of demanding payments in hard currency than in rupees following the decision to trade in hard currency.

Price of sulphur in the Middle East will be in the range of $115 per tonne while Canadian prices are expected to be slightly higher. Purchases will be made on 180-day credit arrangements. A tender for one lakh tonnes is being floated. Meanwhile, the entire contracting for rock phosphate for the current financial year has been completed. The target for the current year is 34 lakh tonnes of rock phosphate. Utilisation levels of rock phosphate-based diammonium phosphate and single superphosphate units are at their maximum, but problems may arise if raw materials lying in the ports are not lifted quickly. Diesel shortage and lack of sufficient number of wagons have hai ered transportation to the plants.

While rock phosphate and sulp supplies may be kept up, the scena with respect to phosphoric-acid ba DAP units is bleak. Inadequate impo have already led to closure of a num of DAP units and, within the next f weeks, all 10 units based on impor acid as raw material will shut down. T situation is expected to exacerbate w the decision import DAP direc instead of phosphoric acid, because would result in some foreign exchar savings.

HYDROGEN OBTAINED THROUGH ORGANIC PROCES

A Japanese scientist claims to ha used bacteria to extract large quantiti of hydrogen — a promising source clean energy — from a simple organ mixture, news reports said on Dec. Mr. Fumiaki Taguchi, a microbiolog at Kitasato University, on the out-ski of Tokyo, took bacteria found insi termites and combined them with yea starch and an amino acid and put the in a container of water, the dai *Yomiuri* newspaper reported. Just 1 grams (a third of an ounce) of the mi ture placed in a litre (quart) of water fo 12 hours produced three litres of hydr gen gas, Mr. Taguchi reportedly sai

DESPITE SODA ASH GLUT

Tata Chem hopes to earn more

Despite the emerging glut situation in its mainstay product — soda ash —Tata Chemicals Ltd. has targeted a higher profit for the current year, according to Mr. Darbari Seth, chairman and managing director of the company. "To the extent it is possible for a management to plan, we have targeted a higher profit", he said, adding, "the implementation of the fertiliser project will not adversely affect Tata Chemicals".

When questioned about the advisability of diversifying into fertilisers at a time when the company's mainstay product was facing a glut situation, Mr. Seth shot back: "Any time is the most opportune time for any company to go into fertilisers." He explained that given the rising population and current production of 6.75 million tonnes of nitrogenous fertiliser against consumption of 7.40 million tonnes, the demand-supply gap will have to be filled with imports.

Tata Chemicals, out of concern for the forex crunch, had drastically reduced its exchange requirement to US $50 million as against the original estimate of US $150 million. Mr. Seth said that the fertilisers project is nearly 25 per cent complete. About Rs. 30 crores has been spent already. The Rs. 980-crore project with an installed capacity of seven lakh tonnes per annum, is expected to be viable under the revised fertiliser pricing policy as it is being set up at a low debt-equity ratio of 2:1 against 4:1 for other projects.

The company has set apart Rs. 150 crores from its internal resources; the financial institutions and commercial banks have sanctioned a rupee term loan of Rs. 302 crores. With the completion of the project, rupee resources amounting to Rs. 852 crores would have been tied-up. The company plans to raise Rs. 187.50 crores through issue of partly convertible debentures (PCD) to existing shareholders, Rs. 9.37 crores from employees, and Rs. 123 crores from non-convertible debentures offered on a rights basis.

The public issue will comprise of preferential allotment of Rs. 38.50 crores to existing shareholders, Rs. 4.02 crores to employees and Rs. 37.97 crores to the public. Tata Chem, the chairman said, was awaiting "deemed export status" for the project before placing orders for major plant and machinery. The supply source for various equipment had already been identified.

Tata Chemicals, which recently entered into an out-of-court settlement with Gas Authority of India Ltd. (GAIL) for a contract to supply gas to its fertiliser project, said it had done so in national interest and in view of the worsening balance of payments position in the country. Mr. Seth said that every day's delay in the implementation of the project could cost the country over Rs. 1 crore in foreign exchange. He refuted the allegation that the delay in implementation of the gas-based fertiliser projects was the cause of over Rs. 2,000 crores worth of gas being flared annually.

He said the HBJ pipeline primarily draws free gas from Basein and can accept only a small part of associated gas through an improvised connection. According to the current reckoning, it would take three years before associated gas can be gathered, compressed and brought onshore. "Even if eight more fertiliser plants were set up along the gas pipeline, there would be no significant reduction in the quantity of gas being flared", he said. Mr. Seth added that while plans were afoot to stop flaring of gas, it would take a couple of years at least before the flaring ceases.

From chemicals to cement

Tata Chemicals Ltd. announced a Rs. 60-crore investment in two projects — cement and detergents. Announci this at Bombay on December 3, t chairman and managing director M Darbari S. Seth, said the detergent u would go off the ground "within hours after we get the registrati number". A Rs. 5-crore investment planned, in the project; the compa will begin trial runs immediately.

In recent years, Mr. Seth has be emphasising the sense of service th inspires his projects. "In order to me competition from Nirma, some gia companies had begun to adulterate soc ash with salt or china clay to increas the weight of the product", Mr. Se alleged. He claims that Tata Chemica will provide consumers with "an una dulterated, environmentally acceptab product that will give value for money and be a trend setter in the field.

It will use a new type of soda ash fo the purpose which has been develope after intense research and experimen with over 800 formulations. Accordin to a company release, "urgent" step are being taken to set up facilities i Pithampur in Madhya Pradesh. Tat Chem Detergents, as the product will b called, proposes to take on consume product giants such as Nirma, Hindu stan Lever, Godrej and TOMCO, whic is in the process of beefing up its pro ducts and market presence.

However, company officials insis that Tata Chem will not be in compe tition at either end of the market but wil carve out its own niche. The exact pric ing will, however, remain a secret unti the product is launched. As for th cement project, Mr. Darbari Seth sai that it would go on stream two-and-a half years after the company receive the industrial license. Plans are afoot t set up a 250,000 tonnes per year plan for manufacturing ordinary portland cement or 300,000 tonnes per year o Pozzolana portland cement with the object of "improving the environment utilisation of waste materials and achieving energy efficiency".

Thapars to set up units in AP, Gujarat

Two major projects from the house of Thapars involving a total investment of over Rs. 53 crores are coming up in the state of Andhra Pradesh and Gujarat. Floated by the Ballarpur Industries (assets at 1987-88 Rs. 45,323 lakhs), the first project is for the manufacture of aniline, mononitrobenzene, sulphuric acid and hydrogen, at Visakhapatnam in Andhra Pradesh. The investment is Rs. 48.50 crores.

The second project, coming up in Jamnagar district of Gujarat will manufacture marine products like beta carotene, algae protein biomass and glycerol, the investment being Rs. 4.50 crores. The AP project's capacity is 10,000 TPA of aniline, 9,650 TPA of alum ferric (by product), 13,600 TPA of mononitrobenzene, 6,000 MTPA of sulphuric acid and 1,010 NM^3/hr of hydrogen.

The Gujarat unit's capacity is: beta carotene 10 TPA, algae protein biomass 200 TPA, glycerol 50 TPA. The company did not have any problem in getting the projects cleared for as the government put it the Thapars had agreed to undertake a 30 per cent export obligation, in the case of aniline to be manufactured in the AP project. Besides, the manufacture of mononitrobenzene, sulphuric acid and hydrogen are all for captive consumption. The company though initially wanted to manufacture alum ferric also, subsequently, it dropped the idea as it was a reserved item for the SSI. The export obligation is for five years, extendable for another five years if the government so desired.

The Gujarat project, one of the few in the world as the company stated in its application, has good export-potential, so much so that the company has agreed to undertake a 60 per cent export obligation of its annual production of beta carotene, extract of marine algae dunaliella, for a period of five years. Beta carotene is a carotenoid found in leafy green vegetables and also found in a much greater concentrated form in dunaliella algae, a marine vegetable plant. Since beta carotene is considered a health product abroad and also used as a food additive and natural food colourant, there was considerable scope for its export.

The company further argued that glycerol is a by-product when beta carotene is extracted from the dunaliella algae. Processed dunaliella algae after extraction of beta carotene and glycerol leave a large quantum of biomass which is rich in protein, minerals and vitamins and can be extensively used as a cattlefeed as well as in aquaculture.

Another factor weighing in favour of the project is that cultivation of dunaliella can be taken up only in coastal areas where there is abundant availability of high salinity sea water, high solar irradiation and very low rainfall. In India, the Gujarat coastal belt fulfills these conditions. In view of these favourable factors the government okayed recently both the projects wit usual conditions like the compan taking adequate steps in regard to po lution control etc.

The AP project will be finance through internal generation of Rs. 1 crores, loans from FI's, Rs. 10.5 crores, loan debentures, Rs. 11 crore and FE loan Rs. 10.50 crores (tota Rs. 48.50 crores), for the project in Guj arat, the means to be employed are internal generation Rs. 166.48 lakh FIL's banks (Rupee loan), Rs. 19 lakhs and FE loans Rs. 85.82 lakh (total Rs. 450.30 lakhs).

Meanwhile the government has also given its consent to the company' revised scheme of financing its Hary ana project (cost Rs. 27 crores) for th manufacture of flyash based autoclave aerated concrete products. The modifie scheme involves internal generation o Rs. 1,350 lakhs, debentures Rs. 39 lakhs, loans from FI's Rs. 396 lakhs and FE loans of Rs. 558 lakhs.

HOC pays record dividend

Hindustan Organic Chemicals Ltd., a Government of India Enterprise has paid a record dividend of Rs. 296 lakhs for the year 1989-90 to Government of India. The cheque was presented by Shri V.K. Aundhe, Director Incharge of the company to Shri M.S. Gill, Secretary, Dept. of Chemicals & Petrochemicals, Ministry of Petroleum and Chemicals, Govt. of India, in Bombay on Nov. 16. HOC had paid dividend for the last 16 years to the Government. There was a marked increase in the company's production and sales during the year resulting in 80% increase in the net profit. The company's operating profit during the year went up to Rs. 59.22 crores compared to Rs. 45.20 crores last year. The net profit touched a new high of Rs. 35.83 crores against Rs. 19.94 crores during the previous year, registering a remarkable increase of 80%.

The total production rose to 2,06,383 tonnes (1,91,123 tonnes). Overall capacity utilisation for Rasayani unit was 103% compared to 101% during the last year and production exceeded the rated capacities in the number of plants like nitrobenzene (110%), aniline (106%), acetanilide (183%), formaldehyde (113%), dinitrobenzene (131%) and nitrochlorobenzene (104%). The capacity utilisation at the Cochin u increased from 58% to 71% in spite total power-cut for the three month The company has registered a reco sales turnover of Rs. 205.05 crores compared to Rs. 176.58 crores duri the last year registering an increase 16 per cent.

National conference on membrane technology for clean environment

Membrane technology has emerged as an energy efficient, cost effective, simple and environmentally clean technology. It has been showing tremendous potential for applications in the areas of water and air pollution control, recovery of valuable chemicals from effluent and hazardous waste management. Membrane application to waste water treatment is perhaps the second largest application after water desalination. To highlight the latest developments in the above subjects, the Indian Membrane Society is organising a two day conference on "Membrane Technology for Clean Environment" in N. Delhi during Jan. 28-29, 1991. The deliberations at the conference will help identify major challenges in this vital area and stimulate academic and industrial research activities. For further details contact: Dr. Raj Kumar, Dy. Mgr. (R & D) & Treasurer, IMS, Research Centre, IPCL, PO: Petrochemicals 391 346. Dist. Baroda, Gujarat. Gram: PETCOMPLEX, Tlx.: 0175-365, Phone: 72011, 72031 Ext. 3492/3460.

IDMA SEMINAR IN CALCUTTA

Speedy revision of drug prices assured

The Indian Drug Manufacturers Association (IDMA) — West Bengal State Board, had conducted a seminar in Calcutta on October 20, 1990 titled 'Health Care System in the Country — and the Drug Industry of Eastern India''. The seminar was inaugurated by Shri Rasheed Masood, Union Minister of State for Health and Family Welfare and Shri Prasantakumar Sur, Health Minister, Government of West Bengal was the chief guest. The seminar was well attended by members of the association and others.

WELCOME ADDRESS — N.I. GANDHI, PRESIDENT IDMA

Welcoming the delegates to the seminar, Shri Gandhi expressed his gratitude to Shri Rasheed Masood and Shri Prasantakumar Sur, for sparing their valuable time and making it convenient to attend. ''Your very presence reflects your keen interest in further improving the health standards of our people'', he said.

Tracing the growth of the industry, Shri Gandhi noted that the country's requirements of medicines is mostly met by indigenous production. The production of bulk drugs and formulations had climbed from a value of Rs. 610 crores in 1989-90 to Rs. 3,360 crores at present. ''From being a net importer of drugs, the country has now emerged as a net exporter. During the last couple of years, India has emerged as a major supplier of bulk drugs both to developed and developing nations which we were importing from not long ago'', Mr. Gandhi noted.

Among the achievements the indu try could be justifiably pround of w its contribution to the development the health of the people. These could measured in terms of the life expectan of the people, which had increased fr 41.2 years fifteen years ago to 5 years now, or the infant mortality ra which had come down from 146 p 1000 to 95 per 1000.

''The industry today is in the fo rank of India's science-based a research-based industries with wid ranging capabilities in the complex fie of drug manufacture and technology said Mr. Gandhi, adding that ''it ran highest amongst the most developed the third world, in terms of quality a technology and a wide range of med cines manufactured''.

Shri Rasheed Masood, Union Minister of State for Health and Family Welfare inaugurating the proceedings by lighting a traditional lamp

Outlining the targets for the Eighth Plan, Mr. Gandhi noted that the Working Group in the Planning Commission had envisaged targets of Rs. 4,890 crores in formulations and Rs. 880 crores in bulk drugs. Exports were slated to move up to Rs. 5,000 crores by 2000 AD. "These are all ambitious targets", said Mr. Gandhi, "but the industry has full capabilities to meet these challenges, if it is allowed a reasonable return on investment".

Mr. Gandhi also noted that for achieving the export targets, a strong, dynamic and financially sound domestic base was necessary. "If the domestic base is weak, it will undermine our export capabilities in the long run", he noted.

Loan licence continuity urged

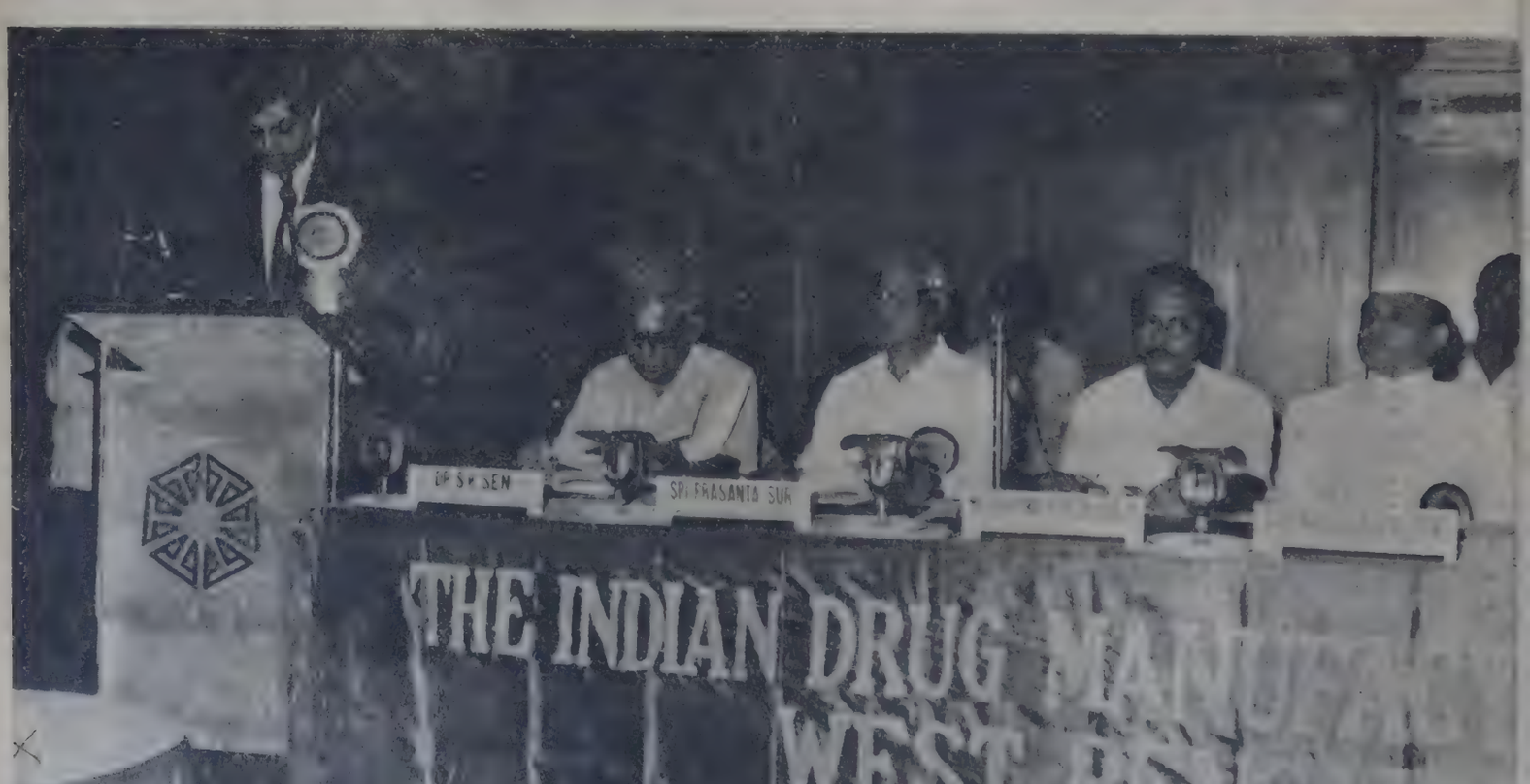
Urging the Government to reconsider its decision to abolish the loan-licence system, Mr. Gandhi noted that the system had not only permitted the SSI sector to use its spare capacity but also helped to significantly reduce the gap between production and demand. "Industry is willing to extend its full cooperation in plugging the loopholes that may be existing in the present loan licence system", he added.

Dual price control

Mr. Gandhi noted that progress in the industry would have been faster if the industry were free of the shackles of price control. "Ironically, this life-saving industry is subjected to dual price control; product-wise price control as well as an overall profitability control". This situation existed inspite of the fact that the industry was nowhere near the profitability ceilings permitted under the DPCO. With the cost of production rising, a measure of price increase is inevitable if the viability of the industry is to be preserved, Mr. Gandhi felt. "Not allowing for the actual costs incurred f raw materials and packing materials a thereby depriving the manufacturers a fair price, even as per the policy the government, is not the remedy. keep the prices down artificially wou only discourage production", he sa adding that "what is required is to che the cost of inputs and reduce taxes medicines". "Tax on medicine is a t on sickness", he added.

In order to realise the objectiv before the industry, Mr. Gandhi urg the Government to

1. ensure reasonable prices to indust
2. channelise fresh investment in th industry
3. encourage R & D by abolition of cu toms duty on chemicals and equi ments required for R & D activit
4. rationalise duty structure so as encourage bulk drug production the country



Mr. N.I. Gandhi, President IDMA delivering his welcome address. Others in the picture from left to right: Dr. S.K. Sen, Vice-Chairman, West Bengal State Board, IDMA; Mr. Prasantakumar Sur, Minister for Health and Family Welfare, Government of West Bengal; Mr. A. Bhattacharjya, Chairman, West Bengal State Board, IDMA; and Mr. Rasheed Masood, Union Minister of State for Health and Family Welfare.

have more teaching institutions for higher training of manpower.

Y-NOTE ADDRESS — SHRI DHENDU BHATTACHARJYA, HAIRMAN IDMA, WEST NGAL STATE BOARD

Highlighting the achievements of the rmaceutical industry in the country, . Bhattacharjya noted that per capita sumption figures in the country were eed low, at Rs. 34 per annum. This ure compared very poorly with the ures of Rs. 340 in South Korea, and . 1,650 in Japan. Although the coun- as a whole was 'drug starved', with % of the population not enjoying the nefits of either the expanded health re system or the modern medicines oduced in the country, the Eastern gion was particularly badly off both th respect to availability of the latest edical facilities or in growth of the ug industry.

rug policy and the health care stem

While the role of health services, alth education, availability of safe inking water, sanitation measures trition and immunisation programmes meet the health needs of the popu- ce cannot be denied, Mr. Bhattachar- a felt that the availability of drugs held e key to the nation's health. "In this ontext, the Drug Policy of the country often reviewed to ensure availability drugs at reasonable price, to streng- en quality and also create an environ- ent conducive to channelising fficient investments in the pharma- eutical industry to make drugs avail- ble to all by 2000 AD. The industry ppreciated such measures and is lways willing to co-operate with the overnment to achieve such objec- ves" Mr. Bhattacharjya noted.

To ensure availability of medicines, h investment of Rs. 1,800 crores has een estimated, and Mr. Bhattacharjya pined that such an investment was not kely to come along unless the Gov-

were permitted for the industry. "The declared Government permissible limit of profit is 8-13 per cent of turnover against current actuals of the organised sector between 3-4 per cent. Any review of the Drug Policy should ensure this minimum profitability, without enforcing undesirable controls and impeding its growth", Mr. Bhattacharjya felt, adding that "our prices compared very favourably with prices in Pakistan, Sri Lanka, Indonesia or even developed countries".

Decrying the urge to take populist measures, Mr. Bhattacharjya noted that medicines cost only 16% of the total health care expenses of a family and only 2.6% of the total budget. "Populist measures will not only harm the health of the nation irreversibly but will also drain out precious resources by making a number of units sick over few years", he said noting that the state-run IDPL had already sustained losses at Rs. 300 crores, and the three Calcutta-based PSU's had sustained losses of Rs. 75 crores since nationalisation.

High incidence of taxes

Mr. Bhattacharjya noted that out of one rupee spent by a consumer for medicine, 40 paise goes to the Government, either as excise duty, sales tax, octroi, purchase tax or turnover tax. "Any welfare state, you will agree should not tax the sick people to such an extent as is being done today in our country", he added.

No controls on SSI

Admitting that the industry has no objection to overall control on profitability, Mr. Bhattacharjya urged the Government to bring about a phased decontrol on prices. Condemning strongly the recent move to bring even the SSI units with turnover above Rs. 1 crore, under price control, he warned that such a move will bring disaster, particularly to the Eastern region where the SSI sector constituted as much as 98 per cent of the total pharmaceutical indus-

Drug purchase policy

Mr. Bhattacharjya urged the Union Health Minister and the Health Minister of West Bengal to frame a policy to abolish regional imbalances in respect of the purchases of drugs made by government departments under various schemes. The current purchase policy was heavily skewed against the Eastern region, which accounted for less than 10% of purchases. He also requested the Government to take the industry into confidence while framing such a policy.

Lacunae in drug rules

Declaring that the drug industry did not believe in any compromise on the matter of quality, Mr. Bhattacharjya pointed out that certain lacunae existed in the Drugs Act which deserved consideration. He urged the Government to take a fresh look at some of these and ensure:

1. Clear guidelines for issuance of "Good Manufacturing Practices" (GMP) certificates.
2. Revisal of packaging norms taking into account the interests of the consumer and the industry.
3. A systematic analysis of the drug inspectors, particularly with respect to their rights to prosecute manufacturers from far off areas.
4. Modification of the concept of a new drug.
5. Continuation of loan licensing system.
6. No dilution of the main objectives of the Drugs Control Administration.

Patents — status quo urged

The Indian Patents Act 1970 had provided the freedom to manufacture bulk drugs to several Indian manufacturers, and had resulted in a strong resurgence of the Indian drug industry. Given these circumstances, there was no overwhelming advantage in India joining the Paris Convention, and Mr. Bhattacharjya urged the Union Minister for Health and Family Welfare to assert on appropriate occasions the need to maintain the Indian Patents Act

Concluding his address, he noted "We shall be happy if due thought be exercised over the rational implementation of

1. Drug Policy vis-a-vis health care projections
2. Infrastructural facilities of health care
3. Regional drug purchase policy
4. Amendment of Drugs Acts & Rules
5. Preservation of the Indian Patents Act, 1970".

ADDRESS BY SHRI PRASANTAKUMAR SUR, MINISTER-IN-CHARGE, DEPARTMENT OF HEALTH AND FAMILY WELFARE, GOVERNMENT OF WEST BENGAL

In the first part of his address, Shri Sur dwelt upon the fundamental problems of the health care delivery system in the country. Tracing the growth of this system, he noted that it could have said to have begun when the British set up the first modern medical college in the country in Calcutta in 1835. The medical care system was largely urban in location and following Independence was extended to the rural areas, with increased number of medical colleges and other para-medical institutions. The measures taken remained far too short to ensure a massive and necessary redistribution of health resources and manpower throughout the society. "In fact two quite separate systems of health care continued side by side, one urban and curative, consisting of expanding number of hospitals in the major towns and cities, and the other, a network of Primary Health Centres serving the rural 80% of the population but in effect divorced from the urban system", he said.

Paucity of resources, unwillingness of health professionals to serve in rural areas, and the draining of meagre resources for high-tech medical care, were some of the problems in the health care area. While the poor still accept misery and poverty as an act of fate, this dumb acceptance of inferiority will not last for long, Mr. Sur warned, adding that "the possibility and vision of a classless social order is the only way to achieve health for all".

National drug authority urged

In order to ensure the ready availability of useful and essential drugs of standard quality at reasonable and fair prices, Shri Sur, urged the setting up of a National Drug Authority, as recommended by the Hathi Committee. Such an authority consisting of representatives of the Union and the States shall deal with all inputs, production, pricing, quality control, monitoring availability, new drugs, imports, medical equipment and appliances all over the country. "If there has been a failure to solve this problem so far, it is because the problem has never been considered in its totality", Mr. Sur opined.

Rationalisation of formulations

Although India has the largest number of drug manufacturers, many of these, particularly in the small scale sector, were formulators, turning out many thousands of formulations. Do we really need these many formulations when the WHO has made a list of only 280 essential drugs, the minister asked. "No agency in India has a list of all the allopathic, ayurvedic and homeopathic drugs that are being manufactured in the country; leave alone adequate machinery to monitor the quality of the drugs", Shri Sur said. "It is feared", he continued, "that as much as 20% of the drugs in the market were sub-standard ones. It is high time that the public be informed as to why the Hathi Committee recommendations still remain in cold storage even after a quarter of a century". Concluding his address, with a plea to ensure continued production of essential bulk drugs to make the nation self-sufficient, Shri Sur put forward a number of recommendations, to the Union Minister for Health and Family Welfare. These included:

1. A National Drug and Food Authority must be set up in India with full powers to dictate policy. This Authority should also have regional set up

2. More central assistance should b forthcoming for development of dru control activities and drug testing labo atories in modern medicine, Indian med icine and homoeopathy.

3. There should be uniform polic regarding whether Food and Drug Con trol should be brought under a singl organisation throughout the whole coun try. While in half the states they ar under a single Authority, they are no so in the other half.

4. There should be a more concerte attempt to integrate the best in the var ious systems of treatment such as allo pathy, ayurveda, Unani, homoeopath etc.

5. The Ministry of Industry should b liberal in granting DGTD licences t drug manufacturers in Eastern India.

6. It is unfortunate but true that ever after the establishment of new Govern ment at the Centre, there is practicall no representation from Eastern India i various expert committees related t drugs and pharmaceuticals from East ern India. In the last seven to ten such committees and expert bodies related t drugs formed by the Central Govern ment not even a single representative drug controller or expert has been included from this region. This position should be reviewed.

7. The Drug Regulatory Agency should be technically strengthened by keeping the options open to bring emi nent persons from the universities pharmacy colleges, medical institution and research institutions. Any myopic view should be scrapped to make i more broad based.

8. Furthermore, in the Central Gov ernment purchases of drugs, the drugs companies of the Eastern region do no get a fair share. To encourage them a fair amount of share of Governmen orders should be made available fo them.

DDRESS OF SHRI RASHEED ASOOD, UNION MINISTER OF TATE FOR HEALTH AND AMILY WELFARE

Expressing his pleasure at being vited to the conference, Shri Masood ressed that his Government was com-itted to the task of "Health for all by 000 AD". "This underlines greater esponsibility on the drug manufactur-rs to produce drugs in the required uality and quantity. The consumer uys a drug with faith; that it is safe and ffective for the intended cure. The Government is alive to its responsibil-y and I am sure the drug producers will ot lag behind and be aware of their bligations", Shri Masood said.

Commenting on the quality assurance rogramme of the Government Shri Masood noted that while the State Gov-rnments are responsible for exercising control over manufacture, sale and dis-ribution of drugs through the state, the Central Govt. controlled the quality of mported drugs, laid down regulatory measures and standards, and approved new drugs in the country. The Govt. of India had also modified the Drugs and Cosmetics Rules, making it a statutory responsibility of the manufacturers to follow Good Manufacturing Practices.

Speedy revision of prices

Noting with concern that the growth rate in the pharmaceutical industry had declined, Shri Masood assured that on its part the Government would strengthen the mechanisms for speedy revision of prices. "The Government will also see to it that prices are fixed so as to ensure to industry the profitability level which was originally envisaged in the Drug Prices Control Order especially with regard to priority drugs", the Minister added.

The Minister also noted that his Government expected that manufacturing units reserve atleast 20% of their production capacity for the production of essential bulk drugs and their formulations. "In this regard it would be willing to liberalise licensing especially for manufacture of those priority bulk drugs which do not involve imports and outgo of foreign exchange", the Minister said.

Fund for quality control

While the Government was taking all steps to strengthen the Central and State Drug Control organisations, Shri Masood called upon industry to assist these organisations by setting aside some funds for creating an infrastructure for quality control. This was of particular importance, in those states where laboratory testing facilities were inadequate. "The issue of approvals and licences in the future could be linked to the presence of inbuilt adequate quality control in the project designs", the Minister noted.

In order to lower the cost of medical care in the country, the Minister urged that co-ordinating mechanisms be created which would identify health problems which could be dealt with at lower costs and equal efficacy by homeopathic, ayurvedic and other indigenous drugs. "The drug industry could lend a helping hand by making available its knowledge and experience to standardise production of those items which could be launched on a commercial scale", he said. The Minister also urged the industry to prepare a standard list of essential drugs required at different levels of the health service infrastructure with realistic demands for each item. "This would require country-wide drug utilisation studies covering the drug outlets to ascertain marketing, distribution, prescription and use of drugs particularly essential drugs. Such collaborative studies between Government Drug control organisations, research institutes and industry would go a long way in avoiding shortages of any essential/priority drugs in the market, and at different levels of the health services infrastructure", Shri Masood concluded.

(Based on reports in IDMA Bulletin, November 21, 1990.)

Excise duty makes iodised salt costly

Excise duty on certain raw materials that go into production of iodized salt have pushed the product beyond the common man's reach. This has happened because, the government has levied a 15 per cent excise duty on iodizing agents such as potassium iodate and calcium iodate, even though it has exempted manufacture of salt, including iodized salt, from excise duty.

The high price of iodized salt —about Rs. 4 per kg — is likely to defeat the health ministry's ambitious scheme, the national goitre control programme, which aims to totally eradicate the dreaded disease by 1992. Many leading organisations, including Bombay Chamber of Commerce & Industry and the Mahratta Chamber of Commerce & Industry, have pleaded for correction of the policy.

Under the present policy, manufacturers of iodized salt are denied the benefit of Modvat set-off fully exposing them to bear the burden of excise duty on iodate inputs. Even though the government has made a provision for compensation the cost of iodization through grant of a subsidy of Rs. 20 per tonne of the iodized salt, most small and medium-scale manufacturers have not been able to avail of the benefit due to imposition of difficult conditions. For instance, one of the conditions requires that at least 80 per cent of the iodized salt be sold in goitre endemic areas, which is hard to adhere to.

In addition, wherever the conditions are fulfilled, bureaucratic procedures and delays have been holding up the subsidies. Even those few availing the subsidy receive it at discounted rates due to bureaucratic delays and procedural hassles.

It is understood that health ministry's budgetary allocation for the goitre control programme and for disbursal of subsidies has been grossly underutilised. If only the unutilised budgetary provision is partially reallocated for excise duty exemption the objective of the scheme could be fulfilled, it is hoped.

Certainly, the government cannot plead that potassium iodate and calcium iodate deserve to be liable to excise duty because they can be put to other uses apart from that as an input for iodized salt.

The only other major use of these iodates is that they are animal-feed supplements. And even on that count, they should not bear excise duty, because the government has exempted dicalcium phosphate from excise duty, because is an animal-feed, the industry has sub mitted. It is illogical to levy duty o inputs of iodized salt, the main weapo in the war against goitre, while exemp tions duties on most other drugs whic are being used to fight ailments like TB leprosy, trachoma, blindness, dehydra tion, malaria and filaria under differen national programmes, salt producer have said.

Price rise of iodised salt not 'due t excise duty'

The Government recently said th effect of excise duty on iodising agent like potassium iodate and calcium iodat cannot be a significant factor in the pric ing of iodised salt. Referring to a news item which said 15 per cent excise duty on iodate imports has increased the price of salt, an official release said the contribution of the excise duty on potassium iodate towards the cost of iodised salt would be even less than one paisa per kg.

In view of this the duty element of one paise per kg. "cannot be respons ible for the reported selling price of four rupees per kg, the release said. It added that the existing rate of 15 per cent excise duty was continuing since 1986 without any change and there had been no fresh increase of excise duty on iodising agents.

Aromatic project needs approval

The joint sector aromatics project planned at Manali, near Madras has to be reviewed and cleared by the new Government at the Centre because of the revision in its cost estimates. Mr. H. Krishnamurthy, Chairman and Managing Director of Madras Refineries, one of the promoters said recently that following Mr. V.P. Singh's instructions, the cost estimates were examined and revised from Rs. 1,356 crores to Rs. 1,380 crores. Though the acutal revision worked out to Rs. 1,430 crores, the contingencies were pruned from 10 per cent to five per cent because of the actual estimation, lowering the cost of Rs. 1,380 crores. "As such it has to be reviewed by the new Government in keeping with its policy to take a fresh look at all decision", he said.

He hoped it would be cleared by the new Government after the Public Investment Board re-examined the revised estimates. Mr. Krishamurthy told a meeting of the Madras Press Club that Madras Refineries had secured Central clearance for several smaller projects worth Rs. 6.50 crores for the Eighth Plan. Since these could be completed by 1993, they were working on some more schemes to be taken up during the Plan.

As the Madras Port Trust and the Electricity Board were processing for a satellite port at Ennore to handle coal, the refinery was asking for the establishment of facilities near the Ennore creek for an oil berth. It would be useful to handle LPG and other petroleum products at that site, given its proximity to the refinery and the petrochemical industries coming up in the Manali area. If the aromatics plant also fructified, the oil berth would be an asset. At present the LPG need of the southern region were met through Visakhapatnam port, but there were some problems in this.

Not affected

The Chairman noted that till now all the 12 refineries in the country had worked to 97 per cent capacity and the Gulf crisis had not affected production or refining. The Government had assured them that the promised crude for the year would be made available. "Elsewhere in the world too, there is no problem about the availability of crude or products. We still have to import them, but the problem is the cost".

Listing the projects to be taken up now by the refinery, he said a lube expansion scheme to step up production from 1.4 lakh tonnes to 2.7 lakh tonnes was to be completed by August 1993 and this would result in a foreign exchange saving of Rs. 90 crores a year. A 0.5 million tonne refinery was to come up in the Cauvery basin at a cost of Rs. 114 crores and would be commissioned in 30 months.

A joint sector additives project in collaboration with Chevron Chemical of America was to be set up in two phases before 1994 at a cost of Rs. 28 crores.

Energy conservation schemes were another highlight of the plans to be undertaken now. Two 20 MW turbines were to be installed at a cost of Rs. 110 crores, to replace old units and augment power generation as the refinery found it more economical to go in for captive generation than risk damage due to poor quality of grid power.

The old refinery was being modernised to step up yield and save energy utilisation.

Own resources

All these projects would be taken up entirely with internal resources without any borrowing or Government funding. The processing capacity was also being stepped up by 0.9 million tonnes at a cost of Rs. 19 crores and would be completed by 1992.

The refinery was also thinking of a steam condensate scheme at a cost of Rs. 1.3 crores to fully tap the steam generated in the campus and put it to productive use.

A Rs. 8.8 crore hexane unit would be coming up with the prospect of extracting vegetable oils. On the fuel conservation side, Madras Refineries has successfully experimented with the use of compressed natural gas for road transport and Gujarat was eager to try it out.

He was keen that Tamil Nadu should go ahead with this experiment with a pilot plant of Rs. 28 lakhs.

It was possible to run 10 buses with one refilling station and four cylinders of gas could take a bus 250 km. A bigger plant would need an investment of Rs. 6 crores.

GUJARAT SORE OVER REDUCED GAS SUPPLY

The Gujarat government is unhappy because it has learnt that the Oil and Natural Gas Commission is planning to reduce the supply of natural gas from 10 million cubic metres to 6.8 million cubic metres per day.

Talking to newsmen, the Gujarat Chief Minister Mr. Chimanbhai Patil who came from Delhi, said that earlier ONGC had promised to supply 10 million cubic metres of natural gas per day on that basis the Gujarat Government had planned to set up gas based petrochemicals complex and two power stations of 615 MW each.

The Chief Minister has specially told the Union Petroleum Minister Mr. S.P. Malavia to "stop playing such a game". Mr. Chimanbhai Patel had also held talks with the Chairman of ONGC and he has promised to reply shortly.

The Chief Minister has also announced that Surat Electricity Company has decided to give relief in power tariff.

OSTING CHEMICAL EXPORTS

Bid to identify areas

Alarmed by the dwindling export nings, the commerce ministry has hed the joint secretary, Mr. T.S. ayaraghavan, to Bombay to identify t least three or four areas of chem-ls, exports of which can be quickly osted with special facilities for supply inputs and prompt procedural correc-ns". In persuance of his mission, Mr. ijayaraghavan, assisted by Mr. R. vari, joint chief controller of imports d exports (JCCI&E) and senior offi-ls from the Reserve Bank of India, stoms department and the Export edit Guarantee Corporation (ECGC), de an attempt to identify the promis-g areas at an 'open house' of the emicals & Allied Products Export omotion Council (CAPEXCIL) ently. Mr. Vijayaraghavan said that the past one month, the ministry offi-ls have made many exercises to olve "crash programmes" to spot the export areas which can be strengthened with minimal extra efforts. Responding to Shree Digvijay Cement's query seeking clarification of the provisions for procurement of indigenous materials in lieu of direct imports, Mr. Tiwari admitted that there are many shortcomings in the provisions and promised that he would make special efforts to correct them. He however, said that JCCI&E had detected many cases of alleged fraud in which companies with their headquarters in Bombay exported goods via places like Madras and Calcutta. In such cases, barring the established trading and export houses, he would investigate the papers relating to all transactions. Mr. V.D. Pendse, deputy controller of foreign exchange at the Reserve Bank, clarified that the RBI has instructed all the commercial banks that all legitimate credit requirements of exporters should be fully met. He however, admitted that commercial banks have been insisting on 50 per cent margin money for exports effected through advance import licences, but added the Reserve Bank has nothing to do with it".

He suggested that CAPEXCIL should take up the issue with the government. Dealing with a plea to exclude "processed minerals" from the List-B of the Reserve Bank's blanket exchange permit scheme, he promised to take up the issue with the government. He apprehended that like last year, "this year also exporters may face shortage in supply of GR-1 forms, because the government has not yet decided on its format". The Reserve Bank expects to supply the new forms on April 1. He promised to examine, "if the specific issues are brought to his notice", whether it is mandatory to declare service charges payable to as Indian company in India, in Indian rupee, in the GR-1 form.

Winding up of Thapar-Du Pont Goa unit recommended

The house committee of the Goa assembly, which is probing the controversial Nylon 66 Thapar-Du Pont project coming up in North Goa, has recommended to the government that it advise the promoters to wind up their activities in the state.

The committee also recommended that the Economic Development Corporation (EDC) and the State Financial Corporation be asked to immediately dissolve their agreements with the company's sister concern, Ballarpur Industries Ltd.

In its 171-page report, submitted to the speaker of the state assembly recently by the committee chairman Mr. A.N. Naik, the government has been asked to stop work on the project. The committee has also admonised the EDC for its involvement in the project and accused the erstwhile Congress (I) government, under Pratap Singh Rane, of collaborating with the promoters in pushing the project through.

The report has also suggested a closer check on the EDC and sought the formulation of clear-cut guidelines for their approval by the state government. The committee has observed that in a tiny state like Goa a large capital-intensive industry is bound to utilise a very significant percentage of available natural resources and infrastructural facilities, and in turn, would contribute almost nothing to the local economy.

The committee has also said that the EDC should be directed to apply for immediate cancellation of two letters of intent, granted by the union industries' ministry, to the promoters. The government has also been asked to introduce the necessary legislation to change the parameters of EDC's work in order to restrict the involvements of the corporation in joint sector projects to what is possible within its investment capacities and technical expertise.

While asking the government to stop all infrastructural work by the promotors on the site, it has requested the Industrial Development Corporation (IDC) to withdraw its letter permitting such developmental work.

The IDC has also been asked not to acquire the entire 258 hectares of land, supposed to be taken over by the company in a phased manner, but to secure the suspension of the land acquisition proceedings for 170 hectares. The report has also claimed that the constructi of buildings by the company was wit out the permission of IDC and witho the company having a clear title to lan

Moreover, it has alleged that t company has not undergone all the re uisite formalities in conversion of t land. The report is silent on one cruci aspect, and that is the question of cor pensation or otherwise, to the promoto for their claim of investment of Rs. 1 crores on development work at the si till date.

Thapar Du Pont flayed for suppere sing data

The Indian National Trust for Ar and Cultural Heritage (INTACH) h accused Thaper Du Pont Limited of fa ing to provide vital environmental da on its Nylon 66 project proposed to b set up in Goa. In a letter to Thapar D Pont Mr. Harshad Kumar Sharm director of INTACH's Goa Chapter, h told the company to be frank in provi ing the data he has asked for.

Otherwise, he said, Thapar Du Po could "go elsewhere". Earlie INTACH had tried to bring about a di logue between various environment groups in Goa and the promoters of th Nylon 66 project — the Thapar grou and Du Pont of the US.

OPPAGE OF WATER SUPPLY

Seven Hazira units issued ultimatum

The irrigation department has issued ultimatum, effective from June 30, 92, to about seven industrial plants th of the public and private sector in Hazira industrial area regarding the ppage of water supply to these units.

The units likely to be affected sev-ely following this cut are the bulk con-mers of water, like Reliance trochemicals Ltd., National Thermal wer Corporation (NTPC), Essar Guj-at Ltd. and the gas processing plant the Oil and Natural Gas Commission NGC). The other units like the Gas uthority of India Ltd., Indian Oil Cor-ration's bottling plant and Larsen and oubro are not likely to be affected uch. The Kribhco's giant fertiliser ant took the lead over others by instal-ng its own independent pipeline from akrapar canal. The pipeline was com-issioned on March 27 this year.

The present water problem in the lazira area dates back to the early eight-es, when only Kribhco had set up its lant in the area, while the Gujarat Gov-rnment was still trying to attract the ndustries and one of the attractions was he assurance to cater to the water emands of the prospective units in the rea through the Kakrapar canal. This canal was meant for having a capacity of 130 million gallons per day (MGD) for agricultural purposes in the area. As on date all the industrial units are drawing water from this canal for their daily requirements.

With the industries drawing water from the canal, it has to be kept open throughout the year. The heavy seepages from the canal and the subsequent water logging in the area surrounding the canal results in heavy damage to the crops. Taking all these factors into consideration, the irrigation department had to issue the ultimatum to the industrial units to go in for their own pipeline and not to depend anymore on the canal.

According to informed sources, Reliance Petrochemicals and NTPC have already approached the GIDC to coordinate the entire pipeline laying project and act as turnkey consultants. The Reliance proposal is already in the final stages and the pipeline laying work is likely to start this month. Essar Gujarat has decided to lay its own pipeline. The important question that arises now is the time and cost factor.

The Kribhco pipeline was expected to be commissioned by December 1988 but could only be commissioned in March, 1990. The total cost of the pipeline works out to Rs. 35 crore. Kribhco also had the advantage of getting the carbon steel pipe with polythene coating from West Germany with practically no import duties. At a meeting held in Ahmedabad in 1985, between the then Central minister, Mr. Yogendra Makwana, the captains of the trade and industry and the state government, Mr. V.V. Patel, the then secretary in the water department, had indicated that it was the government's prerogative to indicate the source and the responsibility to draw the water, he noted, rests with the industries at their own cost.

Later, when the industries learnt that the entire cost will have to be borne by them, the demand which was projected at 140 MGD automatically came down to 100 MGD. The source of the water identified by the government was the Kakrapar river about 82 kms east of the Hazira complex. The cost of laying a pipeline from such a distance was quite high both in terms of time and money. In the meantime, the state government appointed the Gujarat Industrial Development Corporation (GIDC) to act as nodal agency for the planning, designing and execution of the watersupply scheme for cost sharing basis. The scheme of 100 MGD was proposed in two phases.

GAIL draws up expansion plan for HBJ pipeline

A major expansion of the toal capacity of HBJ pipeline will go up to 40 million cubic metres per day, which will be more than double the existing capacity of about over 18 million metres per day.

The Gas Authority of India (GAIL) is expected to submit the proposal to the department of petroleum shortly. After the approval from the department, the proposal will be sent to the Public Investment Board (PIB) followed by cabinet.

This will be the second largest project for GAIL, the first being the original 1700-km HBJ pipeline. This project had cost about Rs. 1,700 crores and was executed by Spie Capag on a turnkey basis. Since the new project is also of the same size, several international companies will be eyeing to bag it if it is decided to float a global tender for the purpose, though no decision as yet has been taken on the issue. However, it may be recalled that a stiff battle was fought by Spie Capag with Snamprogetti to bag the prestigious project.

The new pipeline project has been planned foreseeing growth in demand in the northern region. Earlier GAIL had plans to lay the pipeline from Hazira to the southern region because of a number of gas-based petrochemical projects and oil refineries coming up there.

However, it was felt that the demand in the northern belt was much more. The new pipeline is expected to cater not only to the demands of the industrial sector but also of the domestic sector.

In fact, replacement of petrol with gas for running automobiles is also being considered actively. Though the gas availability was in abundance from the original pipeline, its transportation was not considered 'convenient' both from safety and expenditure point of view.

According to sources, Engineers India Ltd. (EIL) has presented in the report a detailed study of systems that would go into the laying of the pipeline.

"Foreign collaboration will have to be considered and also the World Bank financing", sources said. However, both the EIL chairman, K.M. Subramanyan and the GAIL chairman, Mr. Vineet Nayyar, were not in Delhi for their comments.

GAIL is also undertaking the Rs. 2,500 crore gas cracker plant in Auraiya. It proposes to draw gas the HBJ pipeline itself.

This project, however, is yet accorded clearance by the cabinet. HBJ expansion will be accorded pr ity over the Auraiya cracker by GA as the public sector has the expertis this area.

In fact, GAIL was set up only for purpose in 1984. The objectives which the company was set up inter a including transportation, treatment, p cessing, fraction and to generally d or market or sell natural gas in all forms and fractions. GAIL has und taken small and medium extension pr jects on the HBJ pipeline after laying of the main pipeline.

These included extension of pipeli from Babrala to Delhi covering abo 1,908 kms. From here gas was deliver to NFL (Bijapur), IFFCO, (Aonila Indo-Gulf (Jagdishpur), NTFC (Ant and NTPC (Auriya) plants.

To make effective use of the unde utilised gas capacity of the HBJ pipe line, GAIL has decided to set up an LP recovery plant at Bijapur with a capa city of 4,06,000 tonnes per annum LPG at an estimated cost of Rs. 30 crores. The work on the first phase the project is nearing completion.

IB clears Mangalore Refinery, five power projects

The Public Investment Board (PIB) cleared the joint sector Mangalore finery Project and five other major rmal power projects with a total pacity of 3,250 mw. The total cost of se six projects is estimated to be over . 7,560 crores.

The clearance came at the first PIB eeting held on Nov. 29. This was the st such meeting after the Chandra ekhar government was formed early st month. Considerable significance is ing attached to the PIB approval in ew of the huge cost of these projects d their key nature for the country's an for attaining self-sufficiency in fined petroleum products and thermal ower.

According to official sources, all ese projects will now be referred to e cabinet, whose approval now ppears to be a mere formality. PIB is n inter-ministerial body that looks into uch projects from all possible angles efore clearing it. The much-delayed Mangalore Refinery is a joint sector roject, proposed to be set up by the tate-owned Hindustan Petroleum Cor- oration Limited and Indian Rayon ndustries Limited, a Birla Company. The estimated cost of the project is Rs. 1,100 crores including a foreign exchange component of Rs. 278 crores.

HPCL and Indian Rayon have already signed a memorandum of understanding to execute the project. The public sector company will have a 52 per cent share in the equity, while Indian Rayon will take the remaining 48 per cent share. The projects, as approved by PIB, has a debt-equity ratio of 4:1.

Its internal rate of return is expected to be 15 per cent, while the external rate of return is fixed at 23.4 per cent. The project is scheduled to be completed in four years once the final clearance is obtained.

The refinery project was originally conceived as a naphtha cracker-cum-refinery complex. However, the Planning Commission had doubts about the viability of a cracker unit in view of the projected demand scenario. Thus the government decided to scrap the cracker and allow only the refinery project to come up.

Accordingly, a revised detailed project report was prepared and submitted to the government. The revised project has the following product mix: liquefied petroleum gas — 77,000 tonnes, naphtha — 230,000 tonnes, motor spirit —278,000 tonnes, high speed diesel —800,000 tonnes, kerosene —1030,000 tonnes, furnace oil —238,000 tonnes, bitumen — 100,000 tonnes and sulphur — 13,000 tonnes. The first of the five power projects, cleared by PIB, is the second stage of Farakka super thermal power project, which envisages setting up of two units of 500 mw each. In addition, over 1,100 circuit km of transmission lines would be laid according to the project. The cost of the project is estimated at Rs. 1,427 crores.

The project would be financed by a World Bank loan of $300 million, a DM 70 million loan from Kraft Werks union, Italian loan of DM 329 million and a Yen, 15,055 million loan from the Japan's Exim Bank. The Kayamkulam and Mangalore projects in Kerala and Karnataka, respectively have also been cleared. The Kayamkulam project with two units of 210 mw each will have a cost of Rs. 901 crores. The Mangalore project too will have two units of 210 mw each, but its cost is about Rs. 998 crores. Both projects will get bilateral aid from the Soviet Union. The national capital thermal power project with four units of 210 mw capacity is proposed to be set up at Ghaziabad at a cost of Rs. 1,364 crores. The project will get a World Bank loan of $425 million.

WORLD BANK-AIDED GAS FLARING PROJECT

Don't open bids, ONGC told

The World Bank has told Oil and Natural Gas Commission (ONGC) to return the price bids unopened to the bidders for the proposed western offshore project to stop gas flaring from the HBJ pipeline. Unhappy with the ONGC's administration in planning, processing of bids, evaluation, contracting, expediting and monitoring, the World Bank has said ONGC should not open the priced envelopes of bank-financed contracts and return them unopened to bidders and ask for resubmission only after the technical evaluation was concluded.

Sources in ONGC point out that this is probably the first time World Bank has asked an organisation to return the price bids to international bidders. ONGC has sought about Rs. 3,000 crores ($1,850 million) from the bank to execute the gas flaring project.

The bank team had earlier suggested that all eligible countries should be allowed to participate in the global tenders proposed to be floated for the execution of the gas flaring project. The indication was that India lift the ban on Japanese companies and allow them to participate in the global tenders floated by ONGC. Alternatively, the World Bank has said, ONGC may inform bidders that they will have an opportunity, at their option, to confirm, amend, resubmit or withdraw the priced envelopes before a predetermined date to be agreed with the bank. "Price bids would be opened publicly", the bank has said.

The bank has also said that it will review all the bidding documents. Till such time ONGC has been asked to holdover new bids for other packages related with the project.

The bids were invited for development of two oilfields — L-II and L-III. Once commissioned, the projects will prevent flaring of gas at Bombay offshore, currently estimated at 15 million cubic metres a day, and will enhance crude production by one million tonnes annually. The last date for accepting the bids for L-II project was originally November 28. It was later extended to December 26. The bids for L-III, however, have been received. According to sources, two Korean firms — Hyundai Heavy Industries (HHI) and Daewoo — and one US company, McDermot, have submitted bids for the project.

While the technical evaluation of the bids was under way, the price bids were yet to be opened. According to bank assessment the procurement policy ONGC has been causing delays in ba projects. The gas flaring project offe an opportunity to streamline this fun tion. For this purpose, the bank has su gested assigning of procureme responsibilities at the Central and reg onal levels. ONGC has also been to to establish an adequate administrati structure to carry out procurement, sir plify procedures, assign levels of autho ity for decision making in matte related to procurement and standardi documentation and procedures with the institutions. In all probabilit ONGC is expected to retender the pr ject incorporating all these conditio laid down by the World Bank.

MALAYSIA HIKES OIL OUTPU TO EASE SHORTAGE

Malaysia has increased its crude o production to 650,000 barrels per da to help countries suffering from o shortage due to the Gulf crisis.

Announcing this the deputy minist in the Prime Minister's departme Wong See Wah said recently th Malaysia's readings to help these cou tries, including ASEAN (Association South East Asian Nations) member has boosted the national income due increased exports and higher oil price

Higher allocation likely for ONGC

Thanks to recent steep hike in crude prices in the global market, the Planning Commission is considering a generous allocation for the Oil and Natural Gas Commission (ONGC) for the Eighth Plan. Against the Seventh Plan expenditure of Rs. 11,603 crores, ONGC's allocation for the current Plan is expected to be around Rs. 27,000 crores as per the recommendations of the working group on exploration and production set up by the Commission.

According to informed sources, the Commission is favourably inclined to allocate Rs. 17,000 crores to ONGC in the first go for the Eighth Plan. While the working group for the Seventh Plan had recommended an allocation of Rs. 17,000 crores, the original allocation to ONGC was just Rs. 8,750 crores.

However, the actual expenditure by ONGC during the Seventh Plan totalled Rs. 11,603 crores. The year-wise break-up for the Plan is Rs. 2,123 crores in the first Rs. 2,214 crores in the second, Rs. 2,041 crores in the third, Rs. 2,304 crores in the fourth and Rs. 2,921 crores in the terminal year.

ONGC was able to meet its input costs during the Seventh Plan, due to the fact that crude prices in the international market had relatively fallen and were as low as $ 9-10 a barrel in the third quarter of 1986 with consequential impact on the lowering of prices for the equipment, materials and services in the subsequent period.

So much so, that the rig hiring charges, for example, were practically half of what was in 1980-81. This has enabled ONGC to meet its input requirement as envisaged in spite of lower allocation. The change in heart at the Commission now has come in the wake of sharp increase in crude prices in the international market following war-like situation in the Gulf.

Both, the Petroleum Ministry and ONGC have emphasised on the Commission that if the physical targets have to be retained, the inputs for the programme are essential and any reduction in the allocation would have an impact on the physical targets not only for the first year, but also for subsequent years in the Plan period as exploration to production is a continuous process.

The oil prices are hovering between $ 30 and $ 34 per barrel. Even if the 11-member OPEC group, as it is reported, plans to stabilise the markets by making available the extra oil, prices are bound to be well above the range prevailing during Seventh Plan. ' point has brought into focus the need meeting the resource requirement in oil sector.ONGC plans to add 43.9 lion tonnes of oil during the Eighth P

A comparison between the term year of Seventh and Eighth Plans it provides for an additional allocatio 15 million tonnes increase to 19.7 lion cubic metres of gas. In finan terms, this additional oil could mea saving of $ 11,220 million in fore exchange. Resource allocation to the sector, it is felt, is of vital significan Apart from accelerating the explorat efforts in the Indian sedimentary basi it will enable locating of new sour of oil.

IOC'S REFINING MARKETIN RECORD IN ASSAM

The Assam division of the Indian Corporation has achieved record in grated refining-cum-marketing throu put of over 1.50 million tonnes dur 1989-90. IOC sources attributed the p formance to improvement of the op ating efficiency of the Digboi refine and reinforcement of the supply and d tribution system of petroleum produc In the marketing front, the division h enhanced its storage tankage capac from around 4,000 kl in 1981-82 nearly 41,000 kl now.

Iaharashtra defers decision on gas turbine project

The Maharashtra Government has ferred a decision to allow the Tata ectric companies setting up the pro-sed 180 mw gas turbine project at ombay. At a meeting recently among e State officials, the Maharashtra Pol-tion Control Board and the Tatas the nal clearance for the project was not ven as the MPCB has asked for cer-in more details.

Incidentally the proposed project is to ome up in the same complex which ouses the companies thermal energy tations. The proposal was made by the atas to start a gas turbine station with capacity of producing 120 mw and to roduce another 60 mw from a thermal ower station using the excess gas and eat generated by the gas turbine. This lant was to be set up as the thermal nergy generated by it was not sufficient nough for the ever-increasing power lemand of the city.

The proposal was cleared by the State Government and was sent to the Centre for clearance from where it received a green signal. The State Environment Ministry was again asked to look into the project as certain city-based envi-ronment groups had raised objection.

The gas turbine project is supposed to have low operating ratio as compared to the conventional thermal power sta-tion. In fact of the 180 mw only 120 mw will be generated by gas which will be brought in from Bombay-High through a direct pipe line.

The project will take two years to be completed at an estimated cost of Rs. 350 crores, while the plant load factor of a conventional power plant in the country is at 37 per cent that of the gas turbine will be over 60 per cent and that of the thermal power station will be at around 50 per cent. A meeting to decide about the project was to be held early in December but due to cer-tain reasons it could not be held. The monthly meeting will obviously not be held in December and the decision will come out only in January next year. The decision of the state government will also be important as it will set a prec-edent to other power plants that will come up in future.

CALL FOR SMOOTH SUPPLY OF ENERGY INPUTS

The President of the Federation of Indian Chambers of Commerce and Industry (FICCI), Mr. S.K. Birla, has urged the Government to ensure regu-lar supply of critical energy inputs like coal, electricity and diesel for maintain-ing the tempo of industrial growth. In a news relase recently Mr. Birla pointed out that apart from the critical balance of payments position, inflation was the most serious problem today. Calling upon the industrialists to strive their utmost to keep up the tempo of increas-ing production, Mr. Birla said in the first five months of the present fiscal year the private industrial sector achieved an increase of 15 per cent in production.

The industry must strive hard to keep up the tempo and establish an all-time record this year, he added. He said the increase in production would definitely help in holding the price-line, industry must also look to all means at its dis-posal to tackle the real problem of rapid cost increase by intensive cost-control exercise rather than reverting to the soft option of price increase.

The FICCI President also assured the Government of full support of the bus-iness community in tackling the twin problems of inflation and foreign exchange crunch. Mr. Birla, however, regretted that the cost of inputs includ-ing transport had increased the price considerably.

Hazira heavy water plant to be commissioned soon

Scientists working at the heavy water plant at Hazira, Gujarat are waiting for the first drop of heavy water to be manufactured from the ammonia hydrogen exchange process to formally signal the commissioning of the plant.

The drop of heavy water will also signify the climax of mastering the technology for manufacturing heavy water through the ammonia hydrogen exchange route. India will be ready to assist others in this technology in case the need arises.

The date of arrival of the first drop of heavy water (D20) is around end-December, a slight delay in the date of arrival from the planned one but it is not far from the targeted date set nearly four years ago.

The project activity began in August 1986 and was expected to be completed by November-end 1990. The delays, if any have been partially due to the inability of some of the local manufacturers to deliver the required goods on time. Though some of the goods were delivered almost 15 months late, the final delay was only about a month.

Set up at a cost of about Rs. 264 crore, this heavy water plant will be the fourth plant which will be using the ammonia-hydrogen exchange monothermal process to recover the heavy hydrogen particles for production of heavy water.

The other three at at Baroda, Thal, and Tuticorin. The Hazira plant is almost entirely indigenised.

In the case of the Hazira plant, the ammonia will be supplied from the neighbouring fertiliser plant. The Hazira plant will just use the gas to sieve off the heavy hydrogen particles which will be later used for manufacturing the heavy water. The name plate capacity of the plant is stated to be about 110 tonnes per annum.

The basic raw material for the plant is the ammonia synthesis gas which is one molecule of nitrogen and three molecules of hydrogen. According to calculations by the scientists there are about 115 heavy hydrogen particles per million particles of hydrogen in the gas.

Thus the scientists will be using the technology of ammonia-hydrogen exchange to retrieve the heavy hydrogen particles from the process till they have progressed from 115 ppm to 99.8 per cent composition in heavy hydrogen.

According to one of the top scientists the process is like: "Finding a needle in the haystack and then collecting these needles to form one composite stack of needless only".

So the process finally collects the heavy hydrogen particles and then it is subject to collective burning in a chamber in the presence of pure air which leads to the formation of heavy water. The heavy water board is waiting for the clearance by the Atomic Energy Regulatory Board (AERB) for the last stage of reaction. Each stage of the process of manufacturing the heavy water of Hazira has been cleared by AERB.

Despite having everything well planned out the heavy water plant production will be governed by certain factors external to the plant. First is the raw stock synthesis gas and the deuterium content in it which will be supplied by the fertiliser plant nearby. In case there is a fall in the supply, there will be a fall in the production of heavy water. The second case is the natural gas supply, coming in through the HBJ pipeline. In case there is a fall in the gas supply, this too can hinder production. Then of course there is the pow supply, variation in voltage and fr quency which may also hamper the pr duction.

BIOGAS SLURRY IS A BOON

The Biogas plant is not only a giv of energy but the digester slurry is al proving to be rich fertiliser as well an animal feed. About 20 per cent of t total solids in the digested biogas slur comes into the sludge, which contai such essential elements like nitroge phosphorus, potassium, calcium, boro copper and iron. The fresh biogas slur can be used with irrigation water for fe tilising certain crops, as the Chinese d But if the sludge is to be used as manu to synchronise with the cropping cycl it is better to reduce the moisture co tent by mixing the slurry with saw dus charcoal dust, etc.

At the Centre of Science for Village Wardha, techniques are being devise to convert biogas plant slurry into dr and transportable form. The moistur content has been reduced to 30 per cen by drying the slurry in a slurry-dryin bed and adding gypsum.

The dried sludge can be enriched wit fertiliser or bonemeal. When tried ou on crops at the Indian Agricultura Research Institute, New Delhi, drie slurry gave better results than wet slurry farmyard manures or berseem.

It appears that the anaerobic fermen tation of diluted cow dung (1:1) in th fermentation tank of the biogas plan improves the quantity and quality o protein due to the proliferation o microbial cells.

The Indian Veterinary Research Insti tute, Izatnagar (Uttar Pradesh) fed lamb a mixture of dried and found no observ able effect on the body condition an growth rate of lambs. In fish culture, th use of cow dung based biogas slurr stimulates carp culture better then raw cow dung.

WATER TREATMENT INDUSTRY

Turnover exceeds Rs. 100 crores

The industrial water treatment industry in the country has certainly come of age. It has never been more active, growth-oriented and prosperous than it is today. Its turnover amounted to Rs. 100 crores or a little more in 1989-90.

The demand for industrial water treatment plants will grow still further in view of the projected growth in fertiliser, petrochemical and chemical industries during the Eighth Plan period. The other major user of industrial water treatment plants is the power sector. Also the factor that will boost the importance of the industrial water treatment industry is the constant deterioration in the quality of raw water and its extreme scarcity, for its use in the industry in particular.

In the past, major users of water such as power stations or fertiliser plants had avoided locating themselves at places to where the total dissolved solids (TDS) in water exceeded 600 to 800 parts per million. But because of the acute shortage of suitable sites, power projects, fertiliser plants and petrochemical and chemical industries are perforce located in places where dissolved solids in raw water are in excess of one thousand to one thousand five hundred parts per million.

According to Mr. Nitin Warty, general manager of water and waste water treatment division of Thermax Ltd., in Pune, India's industrial water treatment industry has adequately responded to the requirements of the user industries by acquiring technologies for reverse osmosis and electrodialysis which can successfully use high TDS waters.

Through the acquisition of technical collaboration and through in-house research and development as also technological upgradation the important companies have introduced a number of products and systems for the first time in the country in response to the market needs.

Mr. Warty has pointed out that the work presently carried out in the fields of reverse osmosis, development of resins, optimisation of water treatment, electrodialysis has shown that the country's industrial water treatment industry is quite competent to grapple with challenges which will be faced by its users in future.

For instance Mr. Warty says, witness the recent development in the use of non-polluting chemicals in the treatment of cooling waters. Increasing the cycles of concentration and hence reducing the amount of water wastages has been the response of the country's industrial water treatment industry, giving its users the choice of effective and non-polluting cooling water chemicals as their counterparts in the developed countries have.

The paramount role played by the industrial water treatment industry is best illustrated by its effective treatment of effluents generated by the industry. Since the basics of water pre-treatment and post-treatment of liquids are very similar, most of the major players in the industrial water treatment industry have prospects in the rising demand for effluent treatment plants and systems.

In effluent treatment, the older companies had been typically civil contractors who started with public health engineering jobs and marginally diversified into simpler effluent treatment. A number of such companies are still active suppliers in the effluent treatment market, especially where large civil work is involved, Gannon Dunkerley, Geo Miller. But the pioneer in industrial effluent treatment has been Hindustan Dorr Oliver followed by Thermax Ltd., Ion Exchange, Paramount Pollution Control and many others.

The industrial water treatment i try is dominated by Thermax Ltd Ion Exchange. In addition, there Driplex in Delhi, Watco System Bombay and Gaco Systems in I Thermax Ltd., and Ion Exchange thirty per cent each of the total busi

They have a large share prim because they have progressi upgraded their technology thr inhouse research and development through foreign collaboration. Se and more important, as most of works is of project nature, the m companies have been able to rema the business because of their succ ful project management.

Besides the major companies, t are eight to ten suppliers of indus water treatment plants and system the unorganised sector in each regio the country. The main barrier for a entrant in the industrial water treatm industry does not appear to be tech logy which is presently used either f the process or engineering point view. The main difficulty is their bility to manage projects. This is dent from the repeated emergence closure of a large number of compa in this field.

GANESH BENZOPLAST

Ganesh Benzoplast has fared v during the six months ended Septem 1990, on a turnover of Rs. 4.25 cr (Rs. 2.17 crores), the company earned a gross profit of Rs. 77.95 la (Rs. 44.17 lakhs). After provid Rs. 14.37 lakhs (Rs. 14.35 lakhs) depreciation and Rs. 3 lakhs (nil) taxation, the net profit stands Rs. 60.58 lakhs (Rs. 29.82 lakhs).

The expansion project of the co pany for the manufacture of benz acid and sodium benzoate (3,600 ton per annum) is progressing well. The c of the project is being met throu internal accruals and borrowings fr financial institutions.

GSFC to invest Rs. 1,800 crores more on expansion

Gujarat State Fertilisers Co. Ltd. (GSFC) will additionally invest Rs. 1,800 crores in the coming five years for expanding its production capacity of caprolactam, melamine, ammonia and phosphoric acid. The object is to bring about a balanced growth of 50 per cent industrial products and 50 per cent fertilisers so that the company maintains its profitability, according to the general manager of GSFC Mr. S.R. Mody. Speaking to reporters at Pune, Mr. Modi also disclosed that the company's turnover at the end of March 31, 1990 was expected to cross the Rs. 1,000-crore mark. At the end of March 31, 1991, it would be Rs. 750 crores.

The expansion plans envisaged the increasing of the production capacity of caprolactam from 20,000 tonnes per annum at the existing level to 50,000 tonnes, involving a capital investment of Rs. 800 crores. The GSFC's melamine output would be doubled to 10,000 tonnes by investing an additional Rs. 100 crores. The production capacity of ammonia, which is at present 1,000 tonnes per day, would be increased to 1,350 tonnes per day, by investing an additional Rs. 300 crores. The company had decided to put up a new Rs. 300 crore phosphoric acid plant for restarting its diammonium phosphate plant located at port-town Sikka in Gujarat.

Mr. Mody said the acceptance of GSFC products such as caprolactam, melamine, nylon-6, argon gas and acrylic, used as raw mateirals by industries, increased manifold in Maharashtra in terms of tonnage and value over the past few years. The sales value of different products, except caprolactam, distributed in Maharashtra in 1989-90 amounted to Rs. 22 crore against the expected distribution of Rs. 3 the current year, which would average growth of about 36 over the previous year.

Similarly, Mr. Modi said, value of these products in Pu comprising districts of Pune Ahmednagar and Aurangabad Rs. 3.20 crores in 1989-90 ag expected distribution of Rs. 5. in 1990-91, working to a g about 56 per cent over the l GSFC's sale of caprolactam in region in 1990-91 amounted t crores. The marketing trends Modi put it, showed that GSF play an expanding role by dis more of its raw materials in M tra, after completion of its e plans over the next five years

GSFC has performed very the period ended September 3 with its turnover reaching crores against Rs. 306 crores corresponding six months in t ous year. The gross profit rose t crores (Rs. 40.05 crores) and profit has been Rs. 37 crores crores).

Rs. 15-CRORE MFL ORDE NUCHEM

Nuchem Wier has recently b order worth Rs. 15 crores from Fertilisers Ltd. (MFL) for setti 2.7 million gallons per day treated sewage-based reverse system. According to a company MFL consumed about four mil lons of water per day for its ments. The water has so far be ded from deep borewells ope the Madras Metropolitan Wate and Sewerage Board (MWSSB the recent years this has been h water scarcity and droughts. A dying alternative sources o supply to the plant, MFL has for utilisation of secondary sewage available at MMWSS lity at Kodungaiyur by incorpor

Gas price hike may push up fertiliser subsidy bill

The proposed increase in gas prices for fertiliser units alone will inflate the subsidy bill by over Rs. 2,000 crores by 1993-94. Expressing concern over the "arbitrary" terms and conditions offered by the Gas Authority of India and the Department of Petroleum and Natural Gas, the Fertiliser Association of India (FAI) has reiterated the need for a realistic pricing formula without adversely affecting the health of the industry. The association is also worried over the new gas use policy, which favours use of gas for power generation.

The Department of Petroleum and Natural Gas, while rejecting the recommendations of the Kelkar Committee, has suggested a much higher price of Rs. 2,500 per thousand cubic metres at landfall point and a transportation cost of Rs. 1,219 (against Rs. 850 at present). The acceptance of the Kelkar Committee report would have meant an additional subsidy of Rs. 700 crores on projected urea production up to March 1993 and thereafter about Rs. 440 crores in 1993-94. But as per the new formula suggested by the department, the subsidy for 1993-94 would go up to Rs. 920 crores.

Nearly 41 per cent of the installed fertiliser capacity is based on gas. Regarding the tightening global demand-supply balance, the FAI points out that the 25 per cent Gulf surcharge would mean an additional subsidy outgo of Rs. 165 crores. Likewise, the 7.5 per cent surcharge on corporate tax will also lead to an increase in subsidy expenditure as the pre-tax return under the pricing scheme is revised upwards to avoid erosion of profitability. The association regrets that while the exchequer is not expected to get any additional resources, the fertiliser industry may run into liquidity problems.

The adverse impact of Gulf crisis is not only in the short-run but also has long-term implications. Supplies of ammonia, urea and sulphur have already been cut-off from Iraq and Kuwait. Ammonia supplies from other producers in Bahrain, Saudi Arabia and other locations are also likely to be affected in the current year.

HYDROGEN FUELLED MOTOR-CYCLE DEVELOPED

Scientists at the Banaras Hindu University (BHU) have developed a 'hydrogen fuelled motor cycle' to overcome the oil crisis.

A demonstration of the hy fuelled motor cycle (1000 cc 4 covering a distance of 25 km kms, was given at Varanasi o ember 25, in the presence of sev entists attending the one-day wo on 'energy crisis and hydrogen

THIRUMALAI CHEMICAL

Thirumalai Chemicals has tur good results during the six month ended September 1990. The gros has more than doubled to Rs. 19 from Rs. 65 lakhs in the same last year following a quantum j net sales to Rs. 21.09 crore Rs. 11.67 crores. The net pro soared to Rs. 122 lakhs duri period from Rs. 48 lakhs after ciation (Rs. 72 lakhs against lakhs).

GENETIC VACCINE TO PR VENT PREGNANCY

Scientists in New Delhi ha duced the world's first gen engineered vaccine to preven nancy, it was announced at New on November 29 by the World Organisation. Dr. J. Srinivasan National Institute of Immunolo the vaccine has successfully beer on monkeys and could emerg cheap anti-fertility vaccine for h

IBHCO secures Plan panel approval for Rs. 1,214-crore projects

Krishak Bharati Cooperative as been given the go-ahead by the ng Commission to set up three oots projects worth Rs. 1,214 during the Eighth Plan. The clear- comes after KRIBHCO was n by Abhey Oswal in the race for s. 694-crore gas-based fertiliser at Shahjahanpur in Uttar Pradesh. HCO has been allocated a mere crore for each project by the Plan- Commission, which means that it o generate funds internally. This d not pose a problem, as the coo- ive already has a surplus fund of 00 crores. It is expected to gener- nother Rs. 200 crores in the Eighth period.

e cooperative made a net profit of 91 crores in 1989-90, which is esti- d to reach Rs. 108 crores in the ent year. Fertiliser industry sources KRIBHCO was the most qualified et up the Shahjahanpur project. It d to bag this prestigious project n it bid Rs. 698 crores against al's Rs. 695 crores. Oswal had also n a commitment that there would be ost escalation.

he go-ahead for the new project is ected to provide a boost to the coo- tive. However, the KRIBHCO nagement is keeping its fingers ssed. "There is many a slip between cup and the lip", said a senior exec- e. KRIBHCO runs the biggest fer- er plant in the world in the perative sector at Hazira in Gujarat. plant has a production capacity of 00 tonnes of ammonia and 4,400 nes of urea per day. The capacity isation, according to KRIBHCO rces, is 120 per cent.

GARJUNA FERTILISERS: JTUAL FUNDS MAY HAVE % EQUITY

Mutual funds are expected to have nearly 12 per cent equity stake in the Nagarjuna Fertilisers and Chemicals Limited which is setting up a Rs. 785-crore gas-based fertiliser project at Kakinada in Andhra Pradesh. Nagarjuna Fertilisers is planning to enter the capital market in January next with a public offer for Rs. 108 crores at par to finance the project which is expected to be commissioned in August 1991. Of the public offer, shares for nearly Rs. 10 crores will be reserved for mutual funds which are also contributing Rs. 14 crores towards promoters equity. Thus, the total equity contribution by mutual funds would amount to Rs. 23 crores and account for 12 per cent of the total equity capital of Rs. 196 crores.

The Andhra Pradesh government is contributing Rs. 13.5 crores and KRIBHCO Rs. 10 crores towards the promoters equity of Rs. 88 crores of Nagarjuna Fertilizers, which has been promoted by the Nagarjuna group. Snamprogetti of Italy, which is providing technology, is also acquiring equity shares for Rs. 4 crores out of the promoters equity. Of the public issue, quota for Rs. 9 crores has been reserved for NRIs.

According to Mr. K.V.K. Raju, managing director, the company will have a ready market for its fertilisers in the state which consumes about 1.6 million tonnes of urea per annum. The company has already marketed, under its market seeding programme, through the wide distinction network of 2,500 dealers, over one million tonnes of urea in Andhra Pradesh and adjoining areas. Mr. Raju disclosed that the company has already committed funds totalling over Rs. 700 crores of the total project cost of Rs. 785 crores. It has spent nearly Rs. 525 crores so far on acquiring plant and machinery and other assets.

Tamil Nadu plans joint venture company for lignite exploration

Tamil Nadu government plans to float a joint sector venture to exploit the large lignite potential in Jayakondam area in South Arcot district for power generation, the state chief secretary Mr. M.M. Rajendran said at Madras on November 24.

The lignite potential is estimated to be over 1,000 million tonnes and the area is not reserved for the public sector Neyveli Lignite Corporation (NLC), he said inaugurating a seminar on capital markets and Tamil Nadu companies organised by the Confederation of Engineering Industry (CEI).

Recounting the attractive package of incentives offered in the state and also the availability of a sound infrastructure and good industrial relations, he asked the entrepreneurs to avoid starting power-intensive industries. The present 30 per cent power cut on HT units would be relaxed once the coal supply to the thermal plants improved, he added.

Mr. Rajendran and Mr. E.R. Krishnamurthy, advisor to the Madras Stock Exchange referred to the phenomenal growth in the capital market and urged the companies in Tamil Nadu to take advantage of the boom by shedding their conservatism and reluctance to risk taking.

Mr. Krishnamurthy was optimistic about exceeding the level of Rs. 50,000 crore expected to be mobilised by the primary market during the Eighth Plan end. He wanted the Union government to abolish the tax on dividend income of the shareholders in order to attract more investors to the market. Mr. R. Viswanathan, managing director of SBI Capital Markets said the m have already mobilised ove crores this year against Rs. 5 last year.

The Over the Trade Cou exchange has already co Bombay and is expected to rations from January. It is s big success and help the sm nies to have access to the cap It is also expected to develo of market makers, he said.

Mr. S. Ramanathan, execu tor of MSE said the Union g has cleared in principle the of a stock exchange at Coim it is expected to commence middle of the next year after ognition. Mr. T. Anantha convenor, taxation and fina Tamil Nadu committee said nar is intended to help the in the state to take stock of ing trends in the capital marke of the opportunities by intera the brokers from Bombay, bankers and stock exchangi ties.

COPPER, ZINC, LEAD P REDUCED

The Minerals and Metal Corporation's selling prices zinc and lead have been redu month of December due to fa national prices. Electrolytic c bars will now be priced at per tonne as against Rs. 92,0 Continuous cast copper wire now be Rs. 1,000 cheaper pe Rs. 96,500. Electrolytic HG z for Rs. 51,000 as against Rs. tonne, while special HG zin Rs. 1,000 less, at Rs. 51,200 99.97 per cent and pig lead cent will be priced at Rs. 3 Rs. 35,200 as against Rs. 3 Rs. 36,200 respectively. The nickel pellets and nickel remain the same at Rs. 3.44 Rs. 3.47 lakhs respectively.

erala ties up with Thapar group to make cyolite

he Kerala government has decided e up with the Thapar group to manu- ure cyolite required for making ergents and other similar chemical ducts in bulk quantities. The ernment-owned Kerala State Indus- s Development Corporation SIDC) has signed a memorandum of derstanding with the Thapar-owned arat Starch Company to launch a . 50 crore joint sector venture for the rpose.

The BSC vice-president, Mr. S.N. a, after signing the MoU, said the apars' investment in the project uld be 26 per cent of the total equity, hereas the state government promo- nal body would hold 25 per cent of e shares. The KSIDC managing direc- r, Mr. M.K. Ravindranath, said the rticipation of the public and the finan- al institutions would be ensured in the new project which will go on stream within a year.

The Thapars already own the English Indian Clays Limited in Thiruvananthapuram and have developed the technology required for manufacture of cyolite based on the rich clay deposits in the state with the aid of the Regional Research Laboratory of the Council for Scientific and Industrial Research. Earlier, Thapars had staked a claim to take over and modernise the ailing Titanium projects run by the state government with little flourish and then opted out.

RECESSION IN FERRO ALLOY INDUSTRY

Elkem of Norway, one of the foremost producers and exporters of ferro alloys in the world, has suffered a loss in its operations during three quarters of 1990. The loss is Kroners 1,030 million in the corresponding period of last year. The steep fall in profit is due to the decline in the prices of ferrosilicon and silicon metal as also lower production, due to poorer sales.

The flood of cheap supplies from China and the USSR has cut into the market. Elkem feels that there will be no improvement in the position for sometime due to emerging steel recession as also due to the Gulf crisis. Elkem therefore has cut down production of both ferrosilicon and silicon metal by 10 to 20 per cent and these cuts are likely to continue.

Meanwhile, Japanese ferro alloy producers are reportedly contemplating action against dumping of silico manganese and ferro manganese by certain exporters. Dumping action is also being contemplated by the European ferro chrome producers against Albania and the USSR.

CCS, duty drawback rates hike sought

Exporters have demanded an increase ranging from 10 per cent to 25 per cent in cash compensatory support (CCS) and duty drawback rates to offset the 25 per cent increase in the prices of petroleum products. The exporters have not been compensated for the higher prices of diesel and the relief through incentives would help increase exports, particularly to hard currency areas, they contend.

In a detailed paper submitted to the Commerce Ministry, Mr. Ramu S. Deora, president, Federation of Indian Export Organisations (FIEO), has urged the ministry to drastically cut down the time gap in policy announcements and their implementation. A number of exporters have written to FIEO pointing to the delays. This adversely affects them because they are not able to quote competitive prices, they say.

In view of the deteriorating balance-of-payments position, with growth in imports outpacing that of exports in the first six months of the current financial year, it is imperative to give a push to exports without any delay. The exports have shown an increase of only 22 per cent in April-September 1990, which is none-too-encouraging, it has been pointed out.

The FIEO chief has also urged the government to improve infrastructural facilities like communications, warehousing and transportation of export cargo. Since the last few months of a year are crucial for maximising exports, inadequate space at airports and ports have created difficulties, particularly for textiles, handicrafts and leather products, he has argued.

He has pleaded that the new government should do everything possible by not only maintaining the present structure of assistance and facilities for exporters, but also improving upon them. It is equally important to introduce greater liberalisation and simplification of procedures and provisions, Mr. Deora has emphasised.

This is the only way that the new government can ensure for the country adequate returns in terms of foreign exchange for its economic viability, the FIEO chief has said. Moreover, exporters have demanded that the validity period of import licences be extended to two years. This would help them to stagger their imports and also, as a consequence, reduce the pressure on scarce foreign exchange resources.

Also, it is imperative that the government implement the industrial policy which raised the investment limit for the small-scale sector. This is the need of the hour as small-scale manufacturers and exporters contribute more than 50 per cent of the country's total exports. To curb the mounting import bill, the government has done well to allow imports of certain raw materials only through rep and additional licences, he stated.

Mr. Deora has pointed out that any industry which can arrange its own foreign exchange to import plant and machinery without any disclaimer, including arrangements with non-resident Indians, should be allowed to do so. Also, the concessional duty of 25 per cent may be made applicable to such imports with the condition that it should be paid in foreign exchange.

CUSTOMS VALUATION RULE AMENDED

The government has amended provisions of the Customs Valuation (Determination of Price of Imported Goods) Rules, 1988 to eliminate under-invoicing by importers.

An importer or his agent, is now required to furnish the invoice of the manufacturer of the goods whenever the goods are imported through a person other than the original producer.

This has been done to deter peo from quoting a lower value to av taxes. It has been found that wh people purchase goods from a pers other than the manufacturer, there i tendency to under invoice the value the goods. These provisions come in effect from October 31, 1990.

LEAD ACID BATTERY UNIT NEAR TIRUPATI

Amara Raja Batteries (ARB) will the latest entrant in the lead acid batte manufacturing sector. Its entry will with a marked difference with oth existing manufacturers. Ushering sealed maintenance-free batteries for t first time in India, the company is se ting off a revolution that could well the "beginning of the end of the batte era", according to Mr. G. Gemgulu Galla, Managing Director.

The company will use state-of-th art technology of GMB Inc. of the U to make the sealed maintenance-fre (SMF) battery range.

The Rs. 19.20 crore project is at a advanced stage of implementation Karakambadi near Tirupati. Th installed capacity of the project is or lakh batteries per annum.

To part-finance the project, the com pany proposes to enter the mark shortly with a public issue of 33 lak equity shares of Rs. 10 each, aggrega ting Rs. 330 lakhs. The private pro moter, Mr. Ramachandra N. Galla, a NRI technocrat, having wide experienc in power systems as an electric engineer in nuclear and conventiona source power generating stations acros the US, proposes to take an equity stak of Rs. 197 lakhs. The Andhra Prades Industrial Development Corporatio will provide Rs. 58 lakhs, SBI Mutua Fund Rs. 40 lakhs, LIC Mutual Fun Rs. 20 lakhs and Canbank Mutual Fun Rs. 25 lakhs.

KMML sells 'tickle' to overcome financial crisis

The Kerala government-owned Kerala Minerals and Metals Ltd. (KMML), based at Chavara near Quilon has begun sale of tickle (titanium tetrachloride) to overcome the financial crisis caused by the stagnation in marketing of its finished product, titanium dioxide, an important raw material for the paint industry. KMML general manager (finance) K.M. Ramanunni said that plans were also afoot to sell oxygen to overcome its financial crisis.

Tickle is an intermediary product used as a catalytic agent in various chemical processes. The KMML sold five tonnes of tickle worth Rs. 3.5 lakhs last month. It hoped to get orders for 200 tonnes of tickle every year. He said the KMML also proposed to provide discount and credit sale to prominent consumers to augment offtake of titanium dioxide. It now had an accumulated stock of 1,800 tonnes of titanium dioxide, worth Rs. 14 crores. Titanium dioxide is now available in the Indian market at low prices because of the Union government's decision in June this year to liberalise its import under the open general licence and reduce its import duty from 131 per cent to 85 per cent.

This was done because KMML, the sole producer of upgraded titanium dioxide, could not meet the demand due to technical reasons. But the liberalisation was subject to the condition that the paint industries purchased titanium dioxide from KMML when stocks were available. Mr. Ramanunni said the Indian Paint Association (IPA) had not kept its promise to the government and KMML regarding offtake of titanium dioxide. On a complaint from KMML to the Union industries department, the IPA once again assured that it would help in the liquidity of the stoc ium dioxide with KMML. Ye take position had not improve sale of titanium dioxide stoo tonnes in August, increased tonnes in September and ther declined to 314 tonnes in Oct said the KMML now could pr assured supply of titanium diox consumers, as it had overcom cal problems.

INSURANCE CLAIMS ON EXPORTS TO GULF GO

Insurance claims on account the commodity and project ex Iraq as well as to Kuwait follo recent military build-up in the have been mounting day by day ing to Export Credit Guarantee ration (ECGC). Claims lodg defaults recorded together with in respect of Iraq for short-term (i.e. commodities supplied Rs. 9.83 crores and the claims to Rs. 16 crores in a few day according to sources. Of this su learnt that claims made by TISC were about Rs. 9 crores.

While these fresh claims a being processed, ECGC has claims worth Rs. 7.62 crores lodged with it, including a Rs. 6.6 crores by Zenith Ltd. A portion of Zenith's total export Rs. 36 crores in 1989-90 was and had the credit insurance cov ECGC for a maximum liabi Rs. 49 crores. The claims ma ECGC in respect to long-term (i.e., projects) have reached a s ing sum of Rs. 49.04 crores by ember 21. While these fresh cla being looked into, ECGC settled worth Rs. 27.92 crores in respec guarantees to commercial extended for project exports t Insurance claims on ECGC in of commodity exports to Kuwa swelled to Rs. 3.96 crores, and project exports to that cou

IL draws up Rs. 600 crores pollution control scheme

e Steel Authority of India Limited L) has chalked out a Rs. 600 crore ion control programme. This s part of SAIL's ongoing techni- pgradation works at all its steel s.

e programme envisages phasing f the existing highly pollution caus- processes and plants like open h steel making and desiliconising .

AIL has adopted a two-tier organi- nal structure to tackle the situation e corporate and plant levels. They the central environmental manage- t division at the apex level and envi- nent control department at the ts.

he idea is to develop technical ertise and data base and ensure that new projects have adequate inbuilt eguards.

A fully equipped modern laboratory been set up at the R&D centre for n and steel at Ranchi for specialised dies in pollution control. The World nk is assisting SAIL in undertaking letailed study in this area.

SAIL has already engaged the stralian countries, BHPV/Kin Hill, th the World Bank-funded study at a st of $3.3 million.

The study is expected to be com- eted next month. It aims at incorpor- ing state-of-art environmental onitoring facilities at SAIL plants, sessing the pollution levels and rec- nmending remedial measures and volving training plans for SAIL per- nnel in the area of environmental con- ol.

Monitoring equipment worth $2.8 illion are being installed while action- ans have been drawn up to implement various other schemes during the revamp of existing facilities in plants.

The cost of implementation of 50 such schemes, which are already underway, is Rs. 160 crore. They will be completed by the end of 1992.

Also, there are 41 such schemes, requiring an investment of Rs. 250 crore that have been identified by SAIL and are at the various stages of approval. Subject to their timely clearance by the government, these schemes would be operational by 1995-end.

A SAIL press release claims that once these schemes are fully implemented, its steel plants will reach international standards in pollution control.

This is the most expensive pollution control programme to be undertaken by any industrial corporation in the country.

BAYER (INDIA)

Bayer India has produced satisfactory results during the six-month period ended September, 1990. The turnover is up by 11.8 per cent to Rs. 87.72 crores from that of the same period last year. The gross profit stands at Rs. 8.74 crores against Rs. 7.83 crores showing an increase of 11.6 per cent.

The profit has edged up by 3.9 per cent to Rs. 3.95 crores from Rs. 3.80 crores after depreciation (Rs. 1.89 crores against Rs. 1.28 crores) and taxation (Rs. 2.90 crores against Rs. 2.75 crores).

The company has invested about Rs. 3 crores on pollution control on a recurring basis during 1989-90 and more investments will be forthcoming during the current year.

National plan to combat pollution

The Government of India as drawn up an ambitious National Pollution Control Plan envisaging what is described as a countrywide "security umbrella" against pollution. In this regard the Government, after consultations with the States, has also prepared a list of critical areas to be covered by the plan.

These are: Chembur in Bombay (Maharashtra), Vapi (Gujarat), Pali (Rajasthan), Gobindgarh (Punjab), Singrauli (Uttar Pradesh), Dhanbad (Bihar), Digboi (Assam), Durgapur and Howrah (West Bengal), Talcher (Orissa), Korba (Madhya Pradesh), Visakhapatnam (Andhra Pradesh), Mangalore (Karnataka), Udyogamandal (Kerala), and Manali and North Arcot (Tamil Nadu).

However, World Bank assistance is considered necessary — and is being sought — for effective implementation of the measures against pollution contemplated on such a massive nationwide scale for the first time.

Pollution at hazardous levels can take place in land, water and air, and in fact it has so taken place in most parts of the world, including India. Pollution of the atmosphere is caused chiefly by industries, specifically thermal power stations, iron and steel plants, fertilizer units, copper and aluminium smelters, and oil refineries.

Others contributing to pollution are pulp and paper, basic drugs, dyes, petrochemicals, pharmaceuticals, sugar mills and tanneries.

Major pollutants include lead, mercury, pesticides, carbon monoxide, sulphur dioxide and asbestos. Wide stretches of a number of rivers in India have been vitiated owing to introduction of these toxic matters in their systems. These include Sutlej, Ganga and its tributaries, Chambal, Gomti, Subarnarek Damodar, Godavari, Krishna and S armati.

Despite the Environment (Protecti Act, 1986, and the creation of Cen and State pollution boards, there is tually no control over industries, b in the public and private sector as w as those owned by multinational cor rations, spewing toxic wastes into atmosphere, water sources and fo production.

The country has still not recove from the unprecedented tragedy caus by the leakage of poisonous chemic from the Union Carbide plant at Bho six years ago, which took a toll of o 2,000 lives and maimed, blinded or o erwise incapacitated thousands mor

The world ecology (inter-relationsh of organisms and their environme was introduced into the scientific le icon by Ernst Haeckel, a German b logist some 118 years ago. That was t first sign of an awareness that all co ponents of nature are interwov closely, and that man too belongs to th large pattern.

However, the movement launched f a clean environment and ecologic equilibrium is only two decades old a it may take several years before offici agencies and environmental groups lik the Chipko Movement and the Kera Sastra Sahitya Parishad (that protest against the Silent Valley project) cou get together under a common banner save the environment. It would be rath foolhardy to formulate a plan of actio in the wake of an ecological disaster an forget about it when things have cool down.

For instance, even before the form Prime Minister Indira Gandhi addresse the first UN Conference on Enviro ment in Stockholm in 1972, a sectio of river Ganga became ablaze nea Monghyr in Bihar owing to the dis charge of oil with effluents from th

i Oil Refinery, which had caught
uite often ecological problems
om the rapid growth of industries
discharge waste material into the
nt river and land areas, treating
as regular junkyards.

he seventies, an estuary near Goa
ssed large-scale destruction of
e life on account of water contam-
n. Ammonia and arsenic chemi-
ere discharged from a nitrogenous
ser factory in the vicinity. Simi-
the river Damodar is constantly
gered by steel and chemical indus-
in the region.

lia's thermal power plants spew
millions of tonnes of fly-ash that
in heavy metals such as zinc,
m, and copper. Their dumping
nds usually constitute slurry ponds
y areas. The supernatant liquid
adjoining water courses. When
sed of in lowlying areas, the lea-
percolates into ground water.

here are certain pesticide factories
collect concentrated and toxic
-solid sludge in containers and bury
pits within the industry's premises.
disposal of waste material is likely
esult in the pollution of ground
r. Tonnes of chemical dyes are pro-
d in the country each day. As many
39 organic chemicals, heavy metals
their salts, acids and alkalies are
in the manufacturing units.

he waste gets released in small
ntities into the filter cakes while
lges are formed as a result of setting
neutralisation of waste waters.
ne of the organic compounds are
ly toxic and fatal. Incidents of blad-
cancer, particularly among those
king in aromatic amine conditions
frequently reported. The Kali river
r Kalyan in Bombay, some years
, faced such a catastrophe when the
charge of untreated waste from dye
ustries was seen floating in the water.

Forests along the Kerala-Tamil Nadu border are fast deteriorating due to pollution spewing from cement factories. The Environment (Protection) Act, 1986 attempts to provide a comprehensive law on environment and goes beyond the scope of legislation on water and air pollution, passed in 1974 and 1981 respectively.

Since, environment has been defined to include among other factors the inter-relationship between nature and human beings, it covers a far broader area than pollution. However, in the context of the laws framed to curb pollution, the recent decision to have a National Pollution Control Plan could hopefully serve as a comprehensive shield against industrial pollution.

R&D AWARDS FOR 12 COMPANIES

The department of scientific and industrial research (DSIR) has selected 12 companies for presenting national awards for best in-house R&D efforts in seven areas. In the chemicals sector, the award winners are, Malladi Drugs and Pharmaceuticals and Polychem.

In the electricals sector, Larsen and Toubro and High Energy Batteries (India) Limited have been selected for the awards, whereas Marine Communication Electronics and V. Automat and Instruments have won the awards in electronics sector.

The other winners are, HMT in the mechanical sector, Tata Iron and Steel in the processing sector, Venco Research and Breeding Farm and Pioneer Seed Company in the agro sector and National Organic Chemical Industries and Renewable Energy Systems for successful commercialisation of public-funded technology development.

DSIR instituted these awards in 1987 to give recognition to in-house R&D achievements of the corporate sector.

Pollution busters head for the East

Dire warnings have been given by Chris Pattern, the UK environment secretary, that British exporters could lose out to foreign competitors in the race to capture overseas markets for pollution control equipment.

Britain is in danger of lagging behind in eastern Europe where the market for equipment to clean up the environmental devastation left by the communist regimes is estimated at about £8 bn a year. The hesitancy is understandable. There is shortage of hard currency available to pay for contracts, and legal and commercial confusion during the transition to a free market will remain for some time. Deals were previously concluded with state trading organisations but western businessmen are now faced with a variety of independent organisations and burgeoning companies.

"It is no good relying on out of date information about these countries", says Max Hobbs, group marketing director of Instituform Services. "You have to get your wellies on and go out there". His company, which manufactures a new system for repairing pipelines has already started to penetrate eastern Europe. At the International Environmental Engineering Exhibition in Brno, Czechoslovakia last month Hobbs was swamped with enquiries.

The company has just repaired two pipelines under Vitava river in Prague which were causing pollution. Under the Instituform system a cylinder is inserted in the damaged pipe and expanded to provide a new lining. The company is now negotiating for a job on sewer pipes at Moscow State University.

Chris Salter, a director of Just Water, a West Lothian company producing water purification equipment, was surprised at the interest shown in Czechoslovakia. On the first day at Brno he had 50 enquiries. He was interviewed on local radio and his product appeared on the TV news.

The extent of water pollution in Czechoslovakia was clear in Brno itself. Till recently ago residents of this heavily industralised town were being warned not to drink the water without boiling it. One of the main needs in eastern Europe is for pollution monitoring equipment. The technology is not available there for measuring pollution let alone dealing with it.

Openings exist for companies such as VG Instruments, a division of Fisons, which was at Brno with its selling agents Uni-Export Instruments. It provides a whole range of instruments detecting toxic gas, minute quantities lead or mercury, impurities in drink water or applications for soil analys

It is not a market for fly-by-nig who come in to make a quick sa Servicing of equipement is import and the company has service arms Czechoslovakia and other countries the region. The need to think long te is stressed by Jan Campbell, chairm and cheif executive of Campbell Co cept of Weybridge, Surrey, which sp cialises in development and investme opportunities in eastern Europe.

Campbell is dealing with a proje where the Czechs have developed tec nology for turning ash into artific stones. The Czech sponsors are puttin up half the money but need a furth £100,000 from the West. The Czec face vast environmental problems. Ta chimneys belch smoke from the su phurous brown coal which causes ac rain. In Northern Bohemia near th German frontier whole areas of fore had been badly damaged by acid rai

Bedrich Moldan, environment mini ter for the Czech Republic emphasis that he would like British companies establish joint ventures with the Czech to tackle these problems.

CKAGE TO BAIL OUT ECONOMY

Govt. seeks oil on credit terms from Malaysia, Venezuela

The Union government is understood ave approached Malaysia and Ven-ela to get "oil-credit" from them to nce its rising petroleum imports. The ve is part of a package of measures ng finalised to bail the economy out the present balance of payments oP) crisis.

Other steps in the package are to seek ecial assistance from friendly coun-s like Japan and Germany, tap the oil h countries like the United Arab nirates (UAE) and Iran and mobilise posits from the non-resident Indians RI's) in a big way.

The government has also kept open option for seeking a loan from the ternational Monetary Fund (IMF). A cision on this has to be taken at the olitical level.

In addition, special steps are being ken to earn more foreign exchange rough higher exports and to regulate nports to reduce foreign exchange utgo.

Official sources declined to indicate e likely amount of foreign exchange ssistance the government hopes to raise ith the help of this package. But going y the impact of the Gulf crisis on the conomy, estimated at $2.8 billion, the overnment would not be content with nything less than $3 billion.

The various options and the package o bail out the economy were also dis-ussed at a meeting recently, when enior secretaries briefed the Prime Minister, Mr. Chandra Shekhar, about he magnitude of the BoP crisis.

According to reliable sources, letailed negotations with Venezuela and Malaysia are expected to be held soon. The objective is to import oil from these countries on credit. This will enable India to meet its rising oil import bill without further drawing down its already low foreign exchange reserves.

The amount of credit from the two countries would depend on the quantity of oil they agree to give to India. There is a general consensus in the government that no shortage in petroleum products should be allowed to be created now, which will affect the economy's growth.

Thus, the new government is not hesitating to take a decision on importing more oil products whenever there is a shortage in the domestic market.

Government officials are also holding discussions with representatives of the Japanese and German governments to explore the possibility of their extending assistance to India. Government officials at New Delhi discussed the question of credit with the visiting deputy minister of foreign affairs, Mr. K. Watanabe.

The Indian High Commission in the United Kingdom has also been asked to start negotiations with the governments of UAE and Iran to see if these countries could provide credit at a short notice.

These directives have gone after the UAE has responded positively to initial Indian overtures on this issue.

In fact, other countries in the Gulf including Bahrain and Qatar will also be tapped by India under the proposed package. It is pointed out that these countries have accumulated huge surplus funds following the hike in oil prices. These funds are now available for lending.

The governments attempt to raise deposits from NRIs has already met with partial success. The second series NRI bonds, floated by the SBI Capital Markets Limited from November 1, 1990, has already been able to raise over $250 million, according to reports.

The issue will close on December 31, 1990 and may raise more foreign exchange deposits for the country. More incentives may also be given to attract NRI deposits.

The government has now decided to set up a co-ordination committee to receive suggestions and have a dialogue with various NRI organisations. The committee will sort out any problem that might arise in the implementation of government decisions pertaining to NRIs.

The committee would be in addition to the already existing NRI consultative committee, which is a forum for interaction between the NRIs, banks and financial institutions.

The new committee will be headed by an additional secretary in the department of economic affairs and will include representatives from ministeries of commerce, external affairs, industry and environment.

The government has also decided that the Abu Dhabi office of the Indian Investment Centre (IIC) will continue to function for some more time till the situation there stabilises. This decision has been taken in view of the problems of NRIs following the Gulf crisis and in response to their requests.

Earlier, the government had decided to close down all foreign offices of IIC as part of an economy drive. The latest foreign exchange reserves are estimated at Rs. 3,085 crores, which are just enough to meet one month's imports. It is because of such a low level of foreign exchange reserves that the government has planned this package and clamped down on imports and is taking steps to boost exports.

WB aid sought for Rs. 500 crore environ. project

A World Bank team was in Bombay on November 30, to negotiate terms for a line of credit for a Rs. 500 crore project to improve pollution control measures in industry and strengthen the environment protection boards. The financial institutions have asked the World Bank to consider converting part of the loan into a grant.

The project involves setting up effluent treatment facilities in industrial towns like Vapi in Gujarat and improving pollution control measures in industries like chemicals, dyes and dyestuffs, fertilisers, leather and textiles. The World Bank has been approached for a loan to finance this project. The funds will be channelised through the Industrial Development Bank of India (IDBI).

The financial institutions have sought a World Bank aid for strengthening the administrative facilities of the environment protection boards at the centre and the states. The World Bank delegation is expected to meet officials from the ministries of finance, industry and environment shortly to fix and discuss project finance details.

The World Bank has been approached for nearly Rs. 1,800 crores. The Bank has, so far cleared cement industry and is considering several lines of credit for the other sectors of industry. The Bank is likely to lend around Rs. 400 crores to the textile industry. Funds will be provided for modernising textile mills in the public as well as in the private sectors. The Bank is also expected to contribute to the Textile Workers Rehabilitation Fund (TWRF).

The Industrial Development Bank of India (IDBI) and the Industrial Credit and Investment Corporation of India (ICICI) had earlier approached the World Bank for financing fertiliser projects in India. The Bank however, is not keen to extend funds to a sector that is subsidised by the government.

The Rashtriya Chemicals and Fertilisers (RCF) Limited has sought World Bank aid for a newsprint project in Nigam in Maharashtra. The Bank has asked RCF to draw up a feasibility study for the project expected to cost around Rs. 460-480 crores.

The newsprint plant will be set up in collaboration with Maharashtra Sugar Mills Federation and Maharashtra Industrial Development Corpn. The MIDC has applied to the government for a letter of intent for the plant. The FIs have also sought $200 million for installing energy saving devices in firms and $500 million as a general line of credit

NO CHANGE IN IMPORT LICENSING POLICY

The Government on Nov. 29 denied reports appearing in a section of the press that it had stopped issuing import licences for industrial raw materials and components till December end. An official release at New Delhi said that there had been no change in the import licensing policy. It said meetings of the headquarters and regional supplementary licensing committee were being held regularly and the last one was held on Oct. 23.

SYNTHETICS AND CHEMICALS

Synthetics and Chemicals has suffered a setback in its working results during six months period ended September, 1990. Sale of products and other income amounted to Rs. 72.25 crores against Rs. 64.41 crores same period last year and Rs. 139.77 crores last year.

It has earned a lower gross profit of Rs. 393 lakhs against Rs. 512 lakhs and Rs. 679 lakhs last year. After depreciation (Rs. 87 lakhs against Rs. 60 lakhs) and taxation (nil against Rs. 65 lakhs), the net profit amounted to Rs. 306 lakhs against Rs. 387 lakhs same period last year and Rs. 384 lakhs last year.

Global environmental facility soon

The World Bank has announced the setting up of a new global environmental facility (GEF) jointly with the UN environmental programme and the UN development programme. Some 25 developed and developing countries, at a meeting in Paris agreed to contribute $ 1 billion to $ 1.5 billion for the facility.

The World Bank Vice-president Mr. Ernest Sternm, who chaired the meeting, said he intends to confirm the contributions from the governments in the next few weeks. The Bank will be the administrator of the facility. It expects the facility to be operational before the middle of 1991, a Bank press release said.

The facility has four broad objectives: To support conservation, the use of energy sources which will not contribute to global warming, forestry management and reforestation to absorb carbon dioxide, in order to limit the increase in greenhouse gas emissions to preserve areas of rich ecological diversity, to protect international waters, where trans-boundary pollution has had damaging effects on water purity and the marine environment and to arrest the destruction of the ozone layer, by helping countries to make the transition from the production and use of CFCs, halons and other gases to less damaging substitutes.

To support the fourth objective countries had previously agreed to make $ 160 million available under the Montreal Protocol. The World Bank, United Nations Environment Programme and the UN Development Programme will be the executing agencies for this ozone layer programme.

The three agencies will also implement the global environment facility. The participating countries, in regular semi-annual meetings, will provide overall policy guidance and review th work programme.

EC PLANS TO TAX CARBON EMISSIONS

Plans to tax carbon emissions ar being drawn up in Brussels as part o an ambitious EC environmental pack age to be unveiled shortly. Proposals fo the first "green" fund financed from th EC budget, fiscal incentives to comba pollution, and an "ecolabelling" scheme for goods which meet high standards of environmental protectio are among other measures being pre pared. Mr. Carlo Ripa Di Meana, th EC environmental commissioner is sai to be determined to win commissio approval for the ideas which he hope will provide the foundations of hi policy for the second half of his four year mandate. All would subsequentl need member state support. Most of th issues have been under consideration fo some time, but a significant spur t action was provided recently when th 18 nations of the EC and EFTA com mitted themselves to stabilising carbon dioxide and other greenhouse gases by the year 2000.

EC environmental experts believe introduction of an energy tax is essential if this target is to be met. They argue that the current high oil price presents an ideal opportunity. Full details of the plan have not yet been settled but one idea is that the tax would be increased as energy prices fall back closer to their pre-Gulf crisis levels. It would be related to the quantity of carbon emitted, so that for example coal would be more heavily penalised than oil, and oil would be hit harder than gas. Other internal Brussels negotiations — concerning plans for a registration tax on lorries and a variable purchase tax on cars, related to their petrol consumption — are also at a delicate stage. Officials recognise that these proposals could trespass on member states' jealous guarded sovereignity in the area of taxa-

OTLIGHT ON

Biotechnology & Life Sciences (Part 1)

CTERIA-BLEND MARKETED R TREATING COMPLEX STE OF EFFLUENT STREAMS

A newly formed UK based bio pro-sing company is offering industries ovel tailormade chotch-potch of bac-a to treat complex effluent streams. nidian Bioprocessing, (UK) based in nitestable, Kent, is a joint venture ween engineering and development mpany, AMEC, Chemical and Phar-ceutical company, Rhone Poulenc d the Univ. of Kent which holds the ence for the Microbial Custom Blend ocess.

The Microbial Custom Blend process es a database of several hundred dif-rent species of bacteria to find those at degrade each component of the ixture of effluents from a plant. The acteria are then combined so that they ork together to treat the complete ffluent stream. Some of the bacteria are ken from the plant site itself, where ey have already been feeding and reeding on effluent and so come read-y designed. Many are also found at ocal sewage treatment works.

The company takes a holistic pproach to each plant for treating the ffluent. The company's spokesman aid 'We find that in many cases, plants lispose of different effluents is separ-te streams. But these streams can ometimes be combined in such a way hat they will provide all the nutrients equired to sustain a mixture bacteria, which could not have survived on just one of the streams'.

The first stage in developing a bio-reactor for a plant is to carry out a fea-sibility study, which identifies individual components of effluent and the bacteria species needed to treat them. Bacteria are tested on synthetic effluent. The second stage is to develop a portable pilot bioreactor which can be transported to the plant and is used to treat a small quantity of effluent that is diverted to it. The third stage is to begin to build an industrial scale bioreactor, which the company is initially offered on a monthly rental basis. The compa-ny's spokesman estimates that it takes about a year to reach this point, with total costs — excluding the final bio-reactor — of around £35-40,000 ($ 68-79,000). Vinidian researchers are now investigating bacterial blends that will degrade the most stubborn wastes — those that are highly chlorine-substituted. The company is now draw-ing up proposals for 20 companies in UK, USA, France and Germany and has had enquiries from many more. (*ECN*, 10/3/90, p. 53).

GENETICALLY-ENGINEERED VIRUS UNDER FIELD TRIAL IN UK

Genetically engineered viruses that kill caterpillar pests are to be tested in an enclosed field in the UK for the first time next year. The baculovirus, design-ed by researchers at the Institute of Virology and Environmental Microbio-logy (Oxford, UK), kill caterpillar pests that affect sugar beet and cabbages. One of the two viruses to be tested contains a gene for a bacterial toxin. The resi-due from the virus persists to protect the plant from many different insect species. The other virus contains an insect enzyme that affects the pupation stage of caterpillar growth. Both viruses are designed to self-destruct. The trial was announced at the British Association Meeting in Swansea, Wales last August. (*ECN*, 10/3/90, p. 53).

CORN BULLETS FOR IMMUNIZ-ING CORN AGAINST DISEASE & PESTS

Ciba-Geigy Agrochemicals has recently announced a new genetic engineering method that could immu-nise commercial varieties of corn against attack from disease and pests for generations.

Researchers at Ciba Geigy call the new method Biolistics because it involves shooting minute metal particles coated with genetic molecules into plant cells at high velocity.

The researchers report that Biolistics can give genetic resistance to cereal crops, such as maize and wheat, that have been less responsible to established techniques.

However, Ciba reports that it will take eight years for engineered cereals to reach the market. (*ECN*, 10/3/90, p. 53).

A MUTANT GENE LINKED TO OSTEOARTHRITIS

A mutant gene that causes osteoar-thritis has been found by biochemists and rheumatologists in USA. Osteoar-thritis, also called degenerative joint disease, causes cartilage, the tissue that covers and cushions joints, to wear out, ulcerate and sometime disappear entirely, leaving painful bone-on-bone joints.

Researchers now claim with confi-dence that it is a mutant gene that causes the problem.

In the recent study in USA, genetic material was examined from 19 mem-bers of a family representing 3 genera-tions — nine of whom had a form of osteoarthritis, called primary general-ized osteoarthritis. When the gene for type-II collagen protein from the 9 was isolated, cloned and sequenced, all coding sequencies were found to be normal, except for single base mutation.

The mutation converts an arginine residue to a cysteine, and amino acid not normally found in type-II collagen. The collagen was suspect because previous work by researchers at Thomas Jefferson University (USA), had shown that it is coinherited, and thus associated in some way with osteoarthritis.

This amino acid mutation was present in all affected members of the family, but not in unaffected ones, nor in 57 unrelated individuals. This suggests that some cases of primary generalized osteoarthritis are caused by the mutation, although the researchers believe other mutations or multiple factors could sometimes be involved. Some types of osteoarthritis are known to arise from non-genetic causes, such as joint injuries and bone defects.

A chemical interpretation of the findings is that the arginine-to-cysteine mutation causes deleterious structural changes in collagen. Type-II collagen molecules are composed of three chains that coil around each other to form triple helices. The helices then assemble further into tight bundles called fibrilla. The genetic flaw could possibly be disrupting both the triple-helix structure of type-II collagen and the ability of fibrils to form stable support structures.

This breakthrough could eventually lead to better diagnoses of and therapies for osteoarthritis. Genetic tests to identify carriers of mutation could be developed in future. In addition, the researchers believe it may be possible to develop drugs that manipulate the gene or block its action. (*C & EN*, 10/10/90, p. 8).

EPA IN USA APPROVES FIELD TEST FOR GENETICALLY-ENGINEERED BT

Sandox Crop Protection (USA) Inc. has received EPA approval to field-test a genetically engineered strain of Bacillus thuringiensis (Bt). This approval marks the first ever field-test of a live genetically altered microbe for pesticide activity. Sandoz markets pesticides based on insect toxins isolated from naturally occuring Bt strains for control of army worms, potato beetles and gypsy moths.

According to Sandoz, genetic modification leads to a two or three fold increase in effectiveness in lab tests over commercial strains, but results in microbes no different than ones that might occur in nature through gene exchange. Producing highly target specific insect toxins, the genetically engineered Bt is believed to present no risk to humans or other non-target organisms. Field tests will be conducted at Sandoz's farm at Greenville, USA and if successful, could lead to a new pesticide product in 3 to 4 years. (*C & EN*, 10/10/90, p. 8).

MYCOGEN RECEIVES A *US* PATENT ON A NEW BIONEMATOCIDE

Mycogen (San Diego, Calif.) has recently been granted a US patent for its bionematocides that protect crops and animals from microscopic roundworms. The biopesticide patent is based on Ecogen's research with novel strains of Bacillus thuringiensis (Bt). In the early 1990 Mycogen and Monsanto agreed to collaborate on using Bt technology to develop genetically improved crops with resistance to nematodes. (*Chem Wk.*, 9/5/90, p. 32), (*Chem Wk.*, 6/27/90, p. 74).

TWYFORD INTERNATIONAL WORLD'S BIGGEST TISSUE CULTURE COMPANY COLLABORATES WITH JAPANESE COMPANY

Twyford International Inc. of USA in which Kirin Brewery Co. (Japan) has a big stake, has taken over Weyerhaeuser Tissue Culture Centre in Florida, USA — a leading wood and related products company. TII has become the world's biggest company in tissue culture business with a share of about per cent of the global market after purchase of Hartman's Plants Inc. (Flo ida) in December 1988.

Till now it had three tissue cultu plants in USA and one in the UK wi sales for the 1990 business year pr jected at about ¥2.5 billion.

Kirin Brewery had bought 30 p cent of the equity shares of TII and h become the top stockholder of TII. Kir and TII have teamed up with each oth on mutual licensing of tissue cultu technology and products developed b either of them as well as in use of th other's sales routes.

TII sees the takeover having a 'syn ergy effect' on both technology deve lopment and sales expansion leading t consolidation of its foothold in th world market. (*Japan Chem Wk* 5/17/90, p. 8).

GENE EXPRESSED IN-VIVO VI DIRECT TRANSFER

A new technique in which recombi nant genes are expressed in-vivo afte their direct introduction to tissue site could prove useful in the treatment o diseases such as atherosclerosis an cancer, report researchers at Michiga Medical Centre. The same researc group showed earlier that genes can b expressed in-vivo by implanting gene tically modified endothelial cells at spe cific sites. However, the technique requires prior preparation and transduc tion is the endothelial cells, a proces that takes several weeks. Now the researchers demonstrate expression o a gene in pig arterial tissue after direc transfer of genetic material (instead o previously transduced cells) to the site When a recombinant B-galactosidase gene is introduced to a site — either by direct infection with a retroviral vecto that expression vector plasmids — B galactosidase activity is detected at the site for weeks or months afterwards (*Science 249*, 1285, (1990)).

R-APPLIED SURVEY OF PHYTOPLANKTON ON THE IZON

an Marine Science & Technology e is planning to observe carbon-le assimulation in the sea by look-nto the distribution of phyto-ton and suspended including zoo-ton using laser applied equipment.

ytoplankton living in the ocean nts for 50-60 per cent of carbon de assimulation conducted by all arth's plants. Its activity exerts a influence on global warming ed by CO_2. The new equipment oe mounted on ships and air planes. ship-mounted type is in the final of development and will come into tical use by the year 1992. The basic gning of the airplane mounted type also be inaugurated in 1992. The pment incorporates a Nd/YAG laser measures 685 nm fluorescence, ted from phytoplankton. When n coloured 532 nm laser beams are lied thereupon. It is also capable of lying the laser beams to suspended erials, including zooplankton and suring the intensity of scattered light tted therefrom.

The laser applied equipment has a th resolution of 2m and can search targetted material at a depth of up 50 metres. When mounted on ships l aircraft, it facilitates continuous servation for 12 and 4 hours respec-ely. The researchers expect the uipment to elucidate production/con-nption of CO_2 in the sea and plans combine the above mentioned uipment with artificial satellites in ytoplankton observation in future. *C.W.*, 3/1/90, p. 5).

EW MATERIALS, CHEMICALS FUELS FROM BIOMASS FROM EW TECHNOLOGY ON THE ORIZON

A resurgence of interest in the production of new materials, chemicals and fuels from biomass resources, such as wood, cellulose, lignin, starch and chitin is sparking active R & D efforts in these areas in USA, Japan and several advanced countries.

Biobased materials and chemicals currently under development include composites, conventional plastics with lignocellulosics (chemicals from wood and other plant sources), lignocellulosic non-woven mats that can be pressed into rigid shapes to form doors, walls and even auto body parts; phenolic chemicals produced from wood waste and bark; membranes made from chitosan (a substance derived from chitin of crustacean shells); and biodegradable plastics containing starch.

A major goal of biobased materials R & D is to use renewable biomass resources to make new materials with the same level of performance as metals and plastics but that have special properties such as high strength, lightweight, corrosion resistance and above all environmental degradability (for packaging plastics).

So far the use of biomass in materials and products has tended to be overlooked or underemphasized. The modern homo sapiens have looked at biomass as a source of chemicals but have not looked at its use for building materials and other materials.

But now the tide is turning towards greater and better biomass utilisation. More markets will develop for both low-cost materials and high-performance composites that take advantage of the wide distribution, renewability and recyclability of lignocellulosics and other biomass resources.

However, as yet there is not a single country in the world (not even USA or Japan) has as yet a national policy for recycling and utilization of biomass and wastes. The technology for production of new materials from biomass and wastes is yet in its infancy. Researchers are currently studying the formation of new types of composites between lignocellulosic on the one hand and glass, metals, plastics or synthetic fibres on the other.

In composites, fibres are embedded in a continuous phase or matrix that give the material a definite shape and surface. Researchers at USDA have made molded products from acetylated lignocellulosic fibres.

They have shown that lignocellulosic fibre composites made with non woven mat technology can be formed into rigid shapes.

Applications for these composites include building materials and auto parts. Wood itself a natural composite of cellulose fibres in a matrix of lignin (a phenolic polymer) and hemicelluloses, lacks the consistency and uniformity of properties of a homogenous material.

However, researchers are now able to produce high performance lignocellulosic composites with uniform densities, durability in adverse environments and high strength by using fibre technology and high performance adhesives.

Wood plastic composites are currently being developed in USA and Japan for use in building materials (such as doors, windows, and wall and flooring systems), reusable packaging and other products.

Biomass is now being used experimentally to produce chemicals. One process under development involves fast pyrolsis of wood and bark wastes, followed by chemical fractionation to produce mixtures of phenolic compounds that could replace phenol in phenol formaldehyde thermosetting resins.

The advantage of a process based on a renewable is that the cost of the meterial is lower than the cost of phenol.

Another biomass resource getting increasing attention in Japan and USA is chitin, which is isolated from crustacean shells. One of the most ubiquitous natural polymers, chitin is second only to cellulose in natural abundance.

Controlled deacetylation of chitin has produced chitosan, a substance that complexes metals and natural biomolecules very efficiently. Membranes made from chitosan are being investigated for use in ion transport, blood dialysis and sustained release of pharmaceuticals.

Starch, which can be obtained in abundant amounts from corn and other crops can become a renewable raw material from which a variety of chemicals can be produced, that are now obtained primarily from petroleum. These chemicals include starch derived from alcohols, polyols and acids.

Other researchers are incorporating starch into synthetic polymer films and bottles to enhance biodegradability.

Vegetable oils are another attractive renewable resource to researchers for preparation of a broad variety of unique monomers and polymers. One research group in USA is developing vernonia oil, a natural epoxidized vegetable oil, as a replacement for conventional solvents in alkyd and epoxy coatings and the other applications. Recent research in USA has also shown that lignocellulosic biomass represents a cheap feedstock for biological production of ethanol and other fuels and chemicals.

Researchers at the Solar Energy Research Institute have shown that enzymatic hydrolysis of celllose in pretreated biomass allows conversion to ethanol with every high yields.

The Tennessee Valley Authority (TVA) has been involved in the chemical conversion of cellulosic feedstock to ethanol and other chemicals for more than 10 years.

Science Briefs

W PROCESS FOR HIGH RITY SODIUM

A new method has been identified for duction of high-purity sodium for in the Fast Breeder Reactor at the ira Gandhi Centre for Atomic search, Kalpakkam. In this process, lten sodium tetrachloroaluminate taining excess sodium chloride is ctrolysed at 200 to 250 degrees cels, using a graphite anode and molten dium cathode. Beta-alumina is used a diaphragm in the cell.

Beta-alumina acts as a physical barr between the two compartments and the same time maintains electrochemal contact between the two. Under the fluence of an electric potential, dium ions from sodium tetrachloroaminate move through the membrane to the cathode compartment. Chloride volution takes place at the graphite node.

According to Dr. K.D. Mohandas, ne of the scientists working on this proct, the process is very energy efficient s the operating temperature is low and urrent efficiency is close to 100 per ent. In this process, an energy efficincy of 68.5 per cent can be obtained uring electrolysis at 300 degrees celius. At present in India there is only ne such electrolysis plant, owned by a rivate company at Baroda, which operates at 30 per cent efficiency.

"The process directly yields nuclear and battery grade sodium. One major advantage of the process is that the cells can be operated very conveniently for small requirements of high purity sodium. Recently we have demonstrated the feasibility of sodium production by this new method". Dr. Mohandas said.

Liquid sodium of very high purity is used as a coolant in Fast Breeder Reactors and in sodium-sulphur batteries. Impurities present in sodium coolant can lead to undersirable problems like corrosion of structural materials, mechanial interferences in coolant passages and radioactivity burden in a fast reactor. Potassium-free sodium is essential for better performance of a sodium-sulphur battery.

P.T.I. Science Service
November 16-30, 1990 Pg. 1.

CHILLIE PROTECTS THE LUNGS

Eating chillies may be hot for the tongue and bad for the stomach, but they protect the lungs from the toxic effects of oxides of sulphur and nitrogen, say researchers.

The findings were reported by biochemists of the University College of Science, Calcutta, who studied the protective effects of capsaicin, the main compound present in chillie extracts, on lungs. They isolated 42 per cent pure capsaicin from capsicum frutescens, the common green chillie, by repeated extraction through chromatography and studied its effects on male rats exposed to the toxic fumes of formalin, nitrogen dioxide and sulphur dioxide.

Pre-treatment with capsaicin protected the rats against lipid peroxidisation and oedoema induced by formalin, says a report by A.K. De and J.J. Ghosh in a newsletter of the Indian Council of Medical Research. Pre-treatment with capsaicin significantly decreased the lipid peroxides (LPO), cholesterol and peroxidase activities in rats exposed to 5 parts per million (ppm) of nitrogen dioxide. But it had no effect on the levels of collagen, catalase and superoxide dismutase activities.

The results were reverse in capsaicin-treated rats exposed to sulphur dioxide. The LPO values did not alter much compared to the control group, but the catalase and peroxidase activi-

ties changed significantly. However, more studies are needed to understand the exact mechanism of capasaicin action on the bronchial tracts, the report says.

P.T.I. Science Service
November 16-30, 1990, p. 1,2.

NEW RUST CLEANER

A new rust cleaner solution has been developed by scientists at the Indian Institute of Technology, Bombay. When applied to a rusted surface of mild steel with the help of a nylon wire brush or cotton linters, the solution removed the rust immediately and kept the metal rust-free for more than a month in an inorganic laboratory at 26 degrees celsius and 70 per cent relative humidity.

When the cleansed steel surface is subjected to electroplating, a good adherent nickel coating is obtained. The important compounds in the cleaning agent are ethylene oxide, an inhibitor and an ester specially made for this purpose. The scientists used orthophosphoric acid as a solvent to get a clear solution.

The new rust-cleaning solution did not have any harmful effect on the human skin. Rust cleaners are used normally in industries for the removal of rust as a pretreatment for painting or surface cleaning. Steel surfaces treated with rust cleaners can be painted or coated but cannot be electroplated due to the formation of non-conducting film on the steel surface by rust cleaner.

P.T.I. Science Service
November 16-30, 1990, p. 2.

NEW COATING FOR EQUIPMENT IN SUGAR INDUSTRIES

A new organic coating to protect the steel structures and equipment used in sugar industries has been developed by scientists at Karaikudi. Studies at the Central Electro Chemical Research Institute (CECRI), Karaikudi, in T Nadu, showed that a new epoxy-b coating was much better than ch nated rubber-based paints in protec the steel equipment in sugar indust The results of the studies were publi by scientists, M. Selvaraj and S. Gu iah from CECRI and T. Paz Kumar, from Thanjavur, in the "I letin of Electrochemistry".

In sugar industries, mild steel st tures are affected by corrosion du high temperatures and the high content and impurities in the cane ju

Organic coatings available so have not been effective in control corrosion. Scientists at the CECRI pared the epoxy and chlorinated rub based paints using pigments extenders such as titanium oxide, mica and bentonite. Next, they stu the effects of the two paints on steel panels of different sizes. T showed that the flexibility, impact re tance and wet abrasion of both pa were good, but the hardness and ad sion of epoxy-based paint were slig better when compared to chlorin rubber paint.

Unpainted panels started rus within one month when kept i humidity cabinet. Epoxy-based pai better than chlorinated rubber ba paint for coating equipment in su industries, the CECRI researchers c clude.

P.T.I. Science Ser
November 16-30, 1990, p

CHLOR-ALKALI MEMBRANE ELECTROLYSER

The Central Electro Chem Research Institute (CECRI), Kar kudi, has set up a pilot scale membr electrolyser of 5 kA current, after re successful laboratory-scale trials their chlor-alkali membrane. Membr cell technology is the latest process electrolytic production of caustic so

nbrane cells are pollution-free, as se neither the hazardous pollutant ry nor the carcinogenic asbestos. ition, they consume 20 to 25 per ess electrical energy compared to ntional processes.

cording to Dr. K. Asokan of RI, the cell frames are made of sion-resistant metals. The anode is fied with a special coating deve- by CECRI to suit the specific ting conditions of the membrane An activated cathode of perforated less steel coated with a mixture of ous or non-precious transition ls has been developed by CECRI. scientists say the use of this acti- d cathode results in energy savings 00 to 225 kilowatt hour per tonne austic soda.

P.T.I. Science Service
November 16-30, 1990, p. 2.

NEW SOURCE OF INOSITOL

A new economic method of isolating sitol, a vital ingredient of multivit- n preparations, from corn steep uor has been developed at the Regi- l Research Laboratory, Jammu.

Inositol is not available indigenously the demand for it is largely met ough imports. Both corn steep liquor d rice bran are rich sources not only inositol, but also of phytic acid and ytin which are important for the med- l, dental and food industries. The RL researchers found that of the two, rn steep liquor forms a better source om which isolation is simpler.

The researchers suggest that inositol ould be considered as an import sub- itution product. During isolation, the searchers first removed proteins from e aqueous extract of corn steep liquor nd precipitated phytin in the form of alcium phytate by adding lime.

They next hydrolysed the wet slurry f calcium phytate under alkaline con- itions in an autoclave. The research- ers obtained inositol by filtering out the hydrolysed product and crystallising it. The procedure yields about 4 per cent inositol. By passing the hydrolysed product over a cation exchange, the scientists obtained 70 per cent phytic acid and calcium phytate.

P.T.I. Science Service
November 16-30, 1990, p. 3

YEASTS ISOLATED FROM PALM WINE

Scientists at Hyderabad have isolated several yeasts from palm wine, which they say are responsible for the wine's nutritional value. Out of the various yeasts isolated, Saccharomyces cerevisiae yields more alcohol than others, like Candida utilis and Kluyveromyces fragilis.

Saccharomyces cerevisiae is a better food supplement in terms of cell proteins, amino acids and thiamine composition, an analysis by researchers of the Osmania University, Hyderabad, shows. The most significant result of the study is the finding that Saccharomyces cerevisiae's amino acid composition is similar to that of soyabean and that this strain of yeast could be used as a substitute for soyabean oil.

With 47 per cent proteins and 40 micrograms of thiamine and riboflavin per gram dry weight of the cells, the yeast strain forms a good food supplement, the researchers say.

P.T.I. Science Service
November 16-30, 1990, p. 3

TRYING TO MAKE SQUIDS WORK

In many laboratories across the world, scientists are racing to demonstrate one of the most promising applications of high temperature superconductivity: a magnetometer made from a SQUID, the acronym for superconducting quantum interference device.

According to a report in the journal *Science*, physicists from two laboratories are now close to achieving working models of the device which could ultimately be used for safe, nonintrusive examination of the human body, detailed studies of the earth's crust and even the detection of submarines in oceans.

A SQUID is essentially a superconducting loop with two wire leads attached. Electrons move around the circuit without resistance except at two points, where small barriers are built into their path. Here the electrons can get through only by tunneling.

Because of quantum mechanical interference effects, the voltage across the wire leads serves as a sensitive measure of the applied magnetic fields. SQUID magnetometers which are sensitive detectors of magnetic fields have already proven their worth in sensing extremely weak magnetic fields. Physicists believe SQUIDS will make it possible to detect magnetic fields associated with the heart, lungs, and even the extreme weak fields associated with the brain. The difficulty in making the device however lies in the breaks. If they are more than a few angstroms, the SQUID will not work. Now a technique developed by researchers at IBM involves making a thick circuit with two narrow necks. These necks will often have natural breaks in them because the superconductor consists of many individual crystals or grains and the boundary between the two grains provides a barrier to electric current.

Although the researchers cannot guarantee the presence of such breaks, about five per cent of their attempted SQUIDS have the right combination of grain boundaries to produce a device that works at temperatures of liquid nitrogen at which high temperature superconductors are obtained. IBM's devices have the best signal to noise of any of the devices reported so fa

Another team at the Universit California in Berkeley are studyin other part of a SQUID magneton —the flux transformer which ampl magnetic fields. A flux transformer a large field detecting superconduc loop, coupled to a small multiple coil that generates an amplified ver of the field, fed into the SQUID, an fies the fields. The amplification is portional to the number of turns i coil. Thus, increasing the numbe turns, it is possible to amplify ma tic fields hundreds of times.

The Berkeley scientists have m flux transformers out of the high perature superconductor YBa_2C with input coils of upto 19 turn amplify the field ten times. Accor to the researchers, this was possibl making crossovers — two crisscros strips of superconductor separated b insulating layer.

According to the report in *Scie* the superconductor is so sensitive it tends to lose its superconducti when covered by a layer of ano material.

It took the team nearly six month build crossovers that worked at the t perature of liquid nitrogen. Berke scientists believe that the technology making the crossovers should th open new electronic applications high temperature superconductors.

P.T.I. Science Serv
November 16-30, 1990, p.

FILM PROTECTS CROPS FRO PESTS

A Japanese company, Sumito Chemical Co. Ltd., has developed agricultural mulch film made of density polyethylene that protects cr against thrips, aphids and other phc phobic pests by reflecting ultravi rays. Reports the journal *Prism*,

ause it creates less glare than products made with aluminium a mixing vapour-depositing pro- t makes agricultural work easier.

multi-layered film consists of an iolet reflecting layer and a black made from inorganic microparti-

bsorbs visible rays and effectively ts specific ultraviolet rays. And se pests tend to gather where le rays are strong, but stay away ultraviolet rays, it is especially tive in repelling thrips and aphids h are highly resistant to insecti-

anti-glare surface not only makes sy on the eyes, but also prevents the kled leaf blotch of summer/autumn etables and the scorching of fruits, enhancing the yield and quality of crops.

can be used with a wide variety of cultural products from vegetables fruits to flowers.

P.T.I. Science Service
November 16-30, 1990, p. 11,12

RTILISER REVITALISES MAGED SOIL

A fertiliser developed by a Japanese mpany Ikilun Co. Ltd., can revitalise l damaged by acid rain and chemi- fertilisers. It is mainly composed of nerals extracted from plants, reports journal *Prism*.

Since it returns depleted minerals to soil, its effects are immediate and ng lasting.

This liquid fertiliser is composed ainly of calcium, magnesium and otassium extracted from more than 10 fferent kinds of plants and fruits by bacteria-fermentation process, the ournal said. Though these minerals ave long been known to be effective in preserving raw and processed food products, it was only recently confirmed through studies, to be effective in revitalising soil and plants damaged by acid rain.

The fertiliser, also called Ikilun, is also expected to boost crop productivity.

P.T.I. Science Service
November 16-30, 1990, p. 12

SUPERCRITICAL METHOD AS WASTE DETOXIFIER

A new technology for destroying aqueous toxic wastes called supercritical water oxidation shows promise for detoxifying the waste efficiently, cost effectively and in an environmentally friendly manner, say scientists at the Sandia National Laboratories in California, United States, where work on the technology is under way.

According to the journal *Chemical and Engineering News*, the concept involves relatively low temperature but moderate pressures — about 300 atm. and 500 degrees celsius — conditions under which water becomes a fluid with unique properties that can be used to selectively destroy organic wastes.

Although the concept of using supercritical conditions for oxidizing toxic materials originated about 10 years ago at the Massachusetts Institute of Technology, the journal quoted Sandia Scientist Sheridan Johnston as saying that it is a whole new area of chemistry that remains an enigma.

"No one really knows what goes on inside a supercritical water reactor or how to scale up to commercial operation", the journal quoted Johnston as saying.

"We hope to change that situation and share our results with the industry".

P.T.I. Science Service,
November 16-30, 1990, p. 13

First IUPAC Workshop on Safety in Chemical Production

Summaries of papers presented

ne first IUPAC Workshop on Safety in Chemical Pro-ion was held in Basel, Switzerland from September 9-13,). We present in the following pages summaries of some ne papers presented.

CT FINDING AND BASIC DATA, PART I: Hazar-s properties of substances. R.L. Rogers, ICI Fine Chem- Manufacturing Organisation, Manchester, UK.

The origin of the safety problem which arises not only in manufacture of chemicals but also in their transport, stor- and use is the inherent hazard potential hidden within ubstance. These hazardous properties include toxicity cluding ecotoxicity), thermal stability, fire or flammability l explosivity. However it is critically important to recog-e that the possession of hazard potential by a substance es not make that chemical hazardous per se. For a haz-ous situation to occur i.e. the release of a chemical's hidden ential a trigger mechanism must also be present. This trig- or activation potential resides in the plant/equipment, emical process or method of handling of a chemical.

For example, water is a necessity for life, however it could so be considered as toxic since it can cause drowning. Sim-rly wood in a tree is difficult to ignite and burns relatively owly but when finely divided, as occurs in a sawmill, the sultant fine wood dust can be readily ignited and lead to violent dust cloud explosion. It is evident therefore, that zard characteristics of a material cannot be simply con-dered, measured and tabulated as other physico-chemical roperties of substances such as melting point, vapour pres-re etc. Hazardous properties vary with physical form and epend markedly on the interaction of a material with the ssociated equipment or usage.

In evaluating hazards it is therefore necessary to obtain ata on both the substances being handled and the equip-ent or process within which they are being used. This paper oncentrates on the identification and evaluation of hazar-ous properties of single substances and their undesired ecompositions. The hazards associated with carrying out esired reactions in chemical manufacture are covered in Part I while the problems associated with flammability and igni-ion risks are considered in Part III.

Decomposition of chemical substances is usually an exo-hermic process and is often accompanied by the evolution of gas. The kinetics of such reactions are invariably governed by the Arhenius law i.e. the rate of decomposition, which for exothermic processes is equivalent to the rate of heat evo-ution, increases exponentially with temperature. The hazard arises in practice because the rate of heat loss only increases linearly with an increase in temperature. A similar problem occurs with scale, heat production increases with the mass of volume of the substance while the corresponding increase in heat loss is smaller as it is dependent on the surface area of the container.

Concepts such as adiabatic temperature rise, time to maximum rate associated with undesired reactions and the relevance of Semenov and Frank Kamenetski heat transfer mechanisms will be explained in detail. In addition the problems associated with measuring such hazardous properties and the interpretation of the data obtained and its relation to plant scale situations will be discussed and illustrated with examples in the paper.

FACT FINDING AND BASIC DATA, PART II: Desired chemical reactions. R. Gygax, Ciba-Geigy AG, Basle, CH.

Important data of hazard analysis concern the knowledge of the two components of hazard, severity and probability. As has been shown in the first part, the energy potential inherent in the materials processed is the dominant factor which determines severities. Probabilities are linked with mechanisms of activation of these energy potentials. In order to judge upon such mechanisms, they must be identified and studied.

Physical transformations are normally not linked with release of energy. Therefore, if storage or physical operations are the subject of hazard analysis, an adequate procedure is

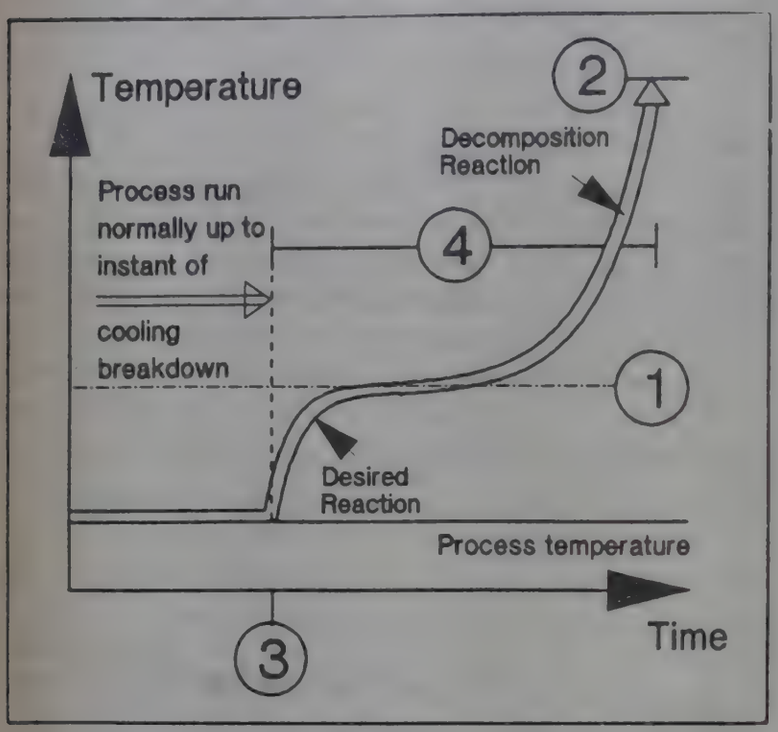
1. to identify conditions under which undesired chemical transformations do produce dangerous rates of energy releases and
2. to define safe operational limits sufficiently away from such conditions.

In chemical syntheses, however, the very goal is chemical transformation, which is often linked with energy release. Then the necessary approach of assessing the thermal hazards is fundamentally different:

For a synthetic process to be safe, two basic conditions must be fulfilled:

1. The heat release during the process must be known and the process equipment must be designed such that safe dissipation of the released heat can be assured at all times.
2. The process must be sufficiently tolerant towards deviations from the operating conditions. E.g. a complete breakdown of the cooling capacity, which is taken as prototype of deviation, must not lead to intolerable consequences.

To satisfy the first postulate, the fact finding procedure involves to providing data on the energy release investigated under the true operating conditions of the process, and then to apply genuine engineering knowledge to deal with the heat dissipation properties of the production equipment and to take into account the laws of scale-up.



The second postulate calls for thermokinetical data on both the desired reaction and the undesired decompositions. These data enable the investigator to sketch worst case runaway scenarios, which must be expected under given failure modes. In order to characterise a failure mode scenario, data on the main features of runaway profiles are determined. They include (See figure):

1. The maximal temperature which will be reached after the cooling breakdown if, in a first consideration, only the heat of the desired reaction is taken into account.
2. An estimate of the end temperature of the runaway of secondary, undesired reactions.
3. The instant within the process, at which cooling breakdown leads to the most consequential runaway profile.
4. The time frame, within which the projected runaway reaction is predicted to occur.

Even if heats of synthetic reactions are comparatively small, the ways of activation of any higher decomposition energies depend strongly upon them and on the way the process is conducted (points 1 and 3). This important statement implies that it is possible and desirable to influence the overall course of the predicted runaway behaviours, and thus the hazards, by process design. Rather than merely testing the final plant procedure for its safety data, the mitigation of its runaway behaviour by optimisation of the process parameters must be considered at the process development stage. This integrative approach allows to reduce the potentials, which is more beneficial than coping with identified hazards by technical and organisational measures taken at the plant level.

The full paper will concentrate on examples and experimental techniques used to evaluate data concerning points 1 and 3. Providing data related to points 2 and 4 requires the same techniques and methods as have been discussed in the prior contribution for the assessment of physical processes and storage.

FACT FINDING AND BASIC DATA, PART III: Fire and explosion.

H. Schacke, Bayer AG, Leverkusen FRG.

Hazard potential

The hazard potential, its origin from the reactivity of the chemical substances and its consequences in safety considerations for chemical production have already been introduced by the preceeding papers (Fact Finding, Basic Data, part I and part II). In terms of flammability and explosivity the hazard potential of chemical processes and plants is given by the ability of many chemical substances to undergo — as the **fuel** — exothermic **oxidation reactions** (combustion processes in the gas phase (i.e. in a certain **desired state**). These reactions are accompanied by considerable energy release, noticeable as heat, radiation, pressure-build-up.

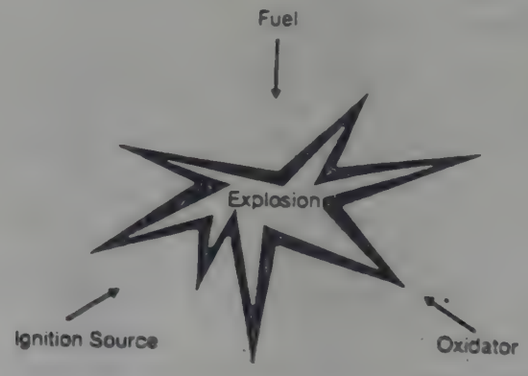


Fig. 1 Explosion factors

In contrast to stationary combustion (burning) for an explosion an independent propagation of the reaction zone (flame) through the free volume with the reactive mixture is essential. This latent hazard potential may be triggered off by an **initiator**, the ignition source. So the unholy trinity of "fuel", "oxidator", and "ignition source" fairly well describes the scope for which basic data are needed.

Combustion properties

Since in this context it is not the chemical substance by itself which represents the hazard potential but its proper mixing with the oxidator (usually the oxygen of the air), in a first step the characteristics of the system fuel/oxidator have to be determined. These should answer the question whether

the substances may give rise for fire or explosions. Important data here are e.g.

1.1 Burning index BZ, burning velocity of coherent solids or powder accumulations
1.2 Flashpoint T_f of a liquid as the lowest temperature at which the liquid will burn when ignited or will form explosive vapour/air mixtures
1.3 Explosion limits LEL/UEL as concentrations of gases, vapours, or dusts dispersed in an oxidising gas phase (including the limiting oxidator concentration LOC), defining explosive concentration ranges.

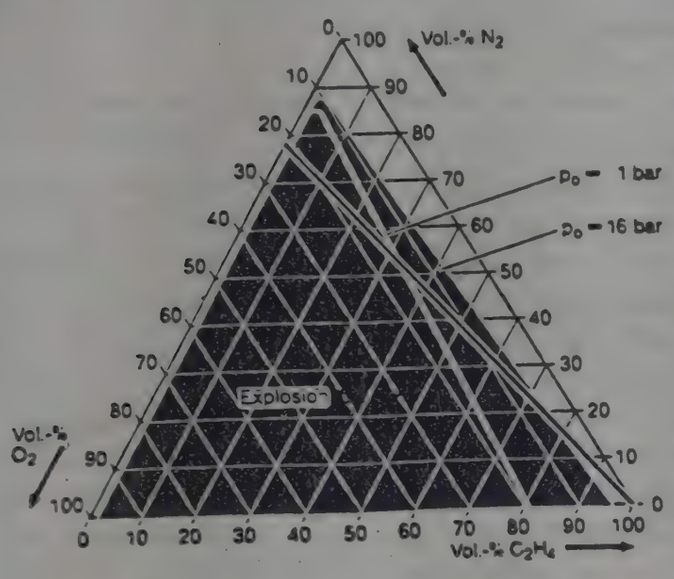


Fig. 2 Explosion limits for $C_2H_4/N_2/O_2$

Ignition requirements

In the second step one will have to find out the (minimum) requirements to activate the fire and explosion hazard, i.e. the flammable or explosive system's characteristics for being ignited. Relevant to this task e.g. the

2.1 Ignition temperature AIT as the lowest surface temperature to start ignition
2.2 Minimum ignition energy MIE as the lowest (electrical) energy to start ignition

can be considered.

Effects of explosion

The third step will focus on the explosive system's behaviour after ignition thus indicating the physical explosion effects. These effects can be characterised by data as

3.1 Maximum explosion pressure P_{max} (in an enclosed volume)
3.2 Maximum rate of explosion pressure rise $(dp/dt)_{max}$
3.3 Heat of combustion H
3.4 Maximum experimental safe gap MESG as a measure for flame quenching.

The above data solely describe characteristics of chemical **substances.** They can be obtained by lab-scale experimental investigations, in a few cases also by calculation methods. (Some of the experimental methods have been standardised). The type of the necessary experimental equipment ranges from rather simple (screening methods) to fairly sophisticated, with the experimental results always being subject to the drawback of **not** describing natural **constants.** Nevertheless, the thus defined characteristics of chemical substances in many cases allow also for a very useful practical classification and rating. The safety data usually will have to be complemented by standard physical/chemical data (e.g. vapour pressure, density, solubility).

Process and plant parameters

As pointed out by the preceding papers, it will not be sufficient for risk assessment having arrived at this base set of data. One will rather have to compare these data with the characteristics of the chemical **process** and the **plant,** also in failure states. Not necessarily that information in all cases has to consist of quantitative numbers. So in a fourth step information must be available with respect to the first and second step about e.g.

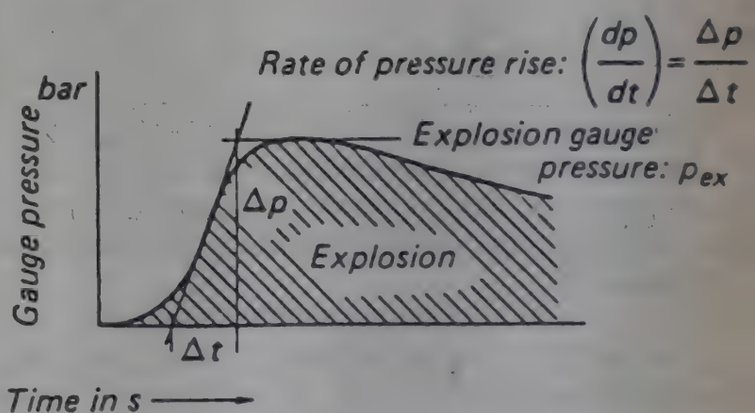


Fig. 3 Typical pressure/time curve

4.1 Presence and amount of oxidisable substances
4.2 Possible process temperatures
4.3 Degree of dispersion of flammable substances
4.4 Generation and characteristics of possible ignition sources (via electrical and electrostatic data, mechanical parameters, apparatus design and materials, etc.).

Conclusion

The base set of data 1 to 3 combined with the information obtained in 4, will provide a sound tool in evaluating the fire and explosion hazard. At the same time they serve as a basis for the design of appropriate safety countermeasures. These measures aim at the **elimination** of at least one of the **explosion factors** or the minimisation of their **coincidence** by a probabilistic concept (ref. Fig.

4, groups 1 and 2) or, alternatively, at the **reduction** of the dangerous explosion **consequences** to a tolerable degree (ref. Fig. 4, group 3). To safely cope with the consequences of an explosion of the respective measures generally require the implementation of (explosion) pressure proof apparatus and equipment.

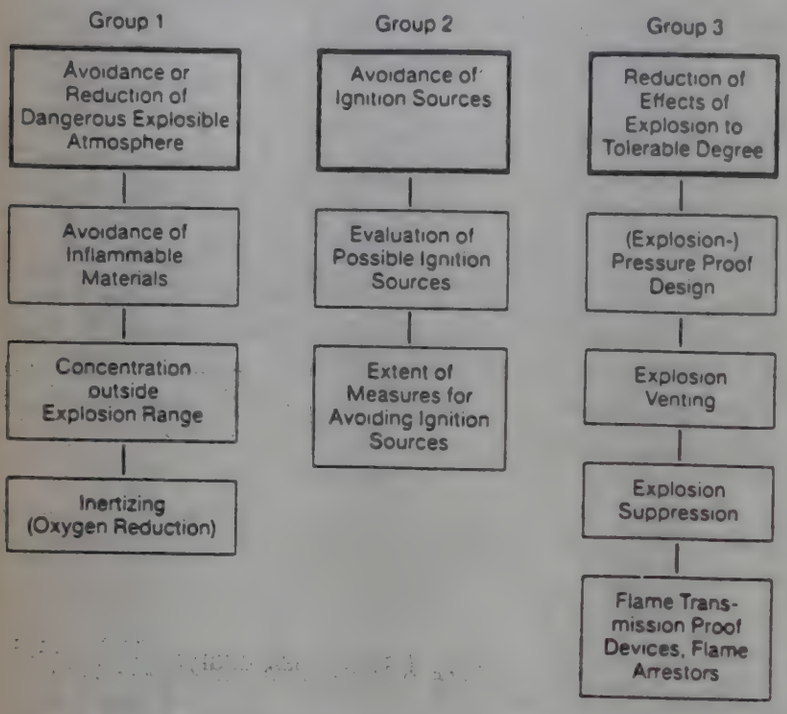


Fig. 4 Principles of explosion protection, relying on basic data according 1-4

IDENTIFICATION OF HAZARDS. V. Pilz, Bayer AG, Leverkusen FRG.

A hazard is the potential harm that a plant or process can cause to living organisms or to the environment. In chemical processes, hazards generally arise from the reactive potential of the substances used. The reactive potential of chemicals can have a direct effect on living organisms. Consequently, the release of a substance of this type can represent a health hazard or damage the environment. A hazard may also occur indirectly if energy is released as the result of an undesired reaction. An explosion is an example of rapid and intense energy release.

In order to ensure that a process is safe, all possible hazards must be identified and assessed, and measures must be taken to counteract them. Suitable measures will be outlined in the section on risk reduction. Hazard identification starts from the basic safety data for the materials, e.g. flammability, explosibility and toxicity. Data characterising these properties are established via tests, as discussed in the section on fact-finding and basic data. One type of hazard, for instance a dangerous reaction with a high energy release rate, can be caused by various factors such as inappropriate materials or an incorrect temperature regime.

Hazard identification thus consists in establishing all the different ways in which a chemical process can reach a dangerous state, as identified by experimental investigation of the basic properties of the materials involved. Proper hazard identification must therefore be based on knowledge of the properties of the materials, process characteristics (as shown in flow charts and piping and instrumentation diagrams), process parameters (such as temperature, pressure, concentration, residence time and flows of heat and mass), and plant design characteristics. Hazards can then be identified by a comparison of process data and possible excursions (or deviations) from these data with the danger spots determined by experiments.

A very systematic procedure is thus required. Hazard identification must be integrated into every stage of the development and design of a process from the laboratory to bench scale, and from basic design to detailed engineering. Various problems are located at each stage, so hazard identification must focus on different aspects as appropriate. Each design and each design stage may bring new hazards which it is necessary to look into. This may involve new experimental investigations and additional measures. Hazard identification therefore has to be based on a stepwise, iterative procedure. It should not only include normal operation of the plant, but also deviations caused by disturbances, e.g. interruptions in the energy supply and variations in input materials, and it should also include start-up, shut-down and maintenance procedures. Finally, hazard identification should accompany the plant design process, becoming more and more detailed as this progresses. Clear and thorough documentation, which can be relied on later, is thus essential.

There are a variety of useful tools which aid systematic hazard identification. Two examples are elaborate checklists based on experience, which outline potential problem areas, and the HAZOP method, which uses guide words to identify problem areas and tables to document the findings. The presentation uses practical examples to demonstrate the use of these methods.

ANALYSIS AND ASSESSMENT OF HAZARDS AND RISKS. J.L. Hawksley, ICI, UK.

Safety in chemicals production requires, firstly, an understanding of the "hazards". It is then the responsibility of those managing the business to ensure that appropriate measures are taken to make the likelihood of harm actually occurring, that is the "risk", as low as is acceptable or tolerable. The understanding of the hazards and the likelihood of harm arising requires technical "analysis" of the possible harmful consequences and the likelihood of events that could give rise to those consequences. The "assessment" of the acceptability or tolerability of the resulting risks requires value

gements to be made. Hence, there is a progression from ard analysis through to risk assessment. There are var- techniques to help with the analysis and assessment; se range from the mainly qualitative to those with vary- degrees of quantification.

Basic hazard indicators are the "intrinsic" properties of substances involved, e.g. flammability, toxicity, volatility, . In some instances there are agreed/accepted values of sc parameters which define various degrees of hazard, e.g. tutory definitions of "very toxic" or "toxic" substances, . Then there are the "extrinsic" factors with regard to the nditions of containment of the hazardous substance — e.g. temperature, its pressure, the environment (with respect the effects on the integrity of containment and the con- quences of loss of containment) and its inventory. A judge- nt of extent of hazard can be made noting these intrinsic d extrinsic parameters.

In some cases there are statutory definitions of substances d quantities that are deemed to constitute "major" hazards g. in the so-called Seveso Directive of the EEC). For flam- able substances a more objective assessment can be made ing, for example, the Dow or Mond Index which gener- es, from the intrinsic and extrinsic factors a number which n be converted from a fixed scale to a qualitative descrip- on of degree of inherent hazard on a scale ranging from, r example, MILD, through HIGH to VERY EXTREME. he hazard index can be extended to give a measure of risk taking account of the various extrinsic safety measures at are or would be needed to ensure safe operation. These off-setting" factors typically reduce the ranking by one or vo levels. For toxic substances some similar hazard indices e available, but are less refined.

The technique of "risk analysis" can be applied when spe- fic accident possibilities can be identified. It involves eva- ation of the consequences and/or likelihood of occurrence f the accident. It may then include an evaluation of risk hen it is possible to estimate, say, the probability of expo- ure of a person, or persons, to the harmful effects of the ccident(s).

How far the analysis can, and needs, to be taken varies rom one situation to another. For example, in some cases consequence analysis with no analysis of probability of ccurrence may be a sufficient basis for an assessment. This ight involve the calculation of the overpressures that could ccur at various locations as a result of an explosion, the gas oncentrations that could occur down wind of a release of oxic gas, etc. In some cases, particularly where the conse- quences of the accident could be very severe it may be help- ul to estimate the likelihood of the event and also the risk f harm in order to judge the significance of the situation. Two parameters of risk are commonly used, "individual risk" (the chance of a person at a given location being killed) and "group risk" or "societal risk' (the likelihood of accidents causing multiple fatalities).

To assess the results of a risk analysis the predictions are compared with appropriate criteria. These include hazard effect levels (thermal radiation, explosion overpressure, etc.) accident frequency targets and "acceptable"/"tolerable" risk values. It has to be stressed that the technique of quantified risk assessment (QRA) has its limitations. Uncertain calcu- lation methods, uncertain data and the need to make a number of assumptions limit the reliability of the predictions. The uncertainty must be taken into account when using the results of an analysis. QRA is a tool to help decision making with regard to, say, what safety measures are necessary, but it cannot be precise and does not remove the need for exper- ienced judgement. The various techniques outlined play a part (along with others) in helping to achieve the optimum ways of assuring safety in chemicals production.

REDUCTION OF CONSEQUENCES. K. Eigenmann, Ciba-Geigy AG, Basle, CH.

The result of the previous steps of risk analysis — col- lection of basic data, definition of safe process conditions and identification of potentially hazardous deviations thereof — is a list of hazards, which are evaluated with regard to pro- bability of occurrence and severity of possible consequen- ces. All these analyses are the basis for the actual risk reduction. Risk reduction without prior systematic analysis may be incomplete and incoherent.

In order to reduce risk two principal routes are possible: Reduction of possible consequences (or severity) and reduc- tion of probability (or frequency). Both are equivalent only from an insurance point of view. In a technical and opera- tional sense the two dimensions of risk are quite different: Risk reduction by reducing the possible consequences usu- ally is an inherent improvement of a process or installation, whereas reduction of probability is often only effective as long as maintained and managed properly. Furthermore, emergency preparations must always be directed against the most severe possible consequences.

In the chemical industry the severity or consequences of a risk depend primarily on the properties and amounts of the chemicals used and stored and on the characteristics of the reactions and processes. Therefore, reduction of consequen- ces must be a design criterion in the early stages of process development. Key factors are

— the synthesis route, which determines the chemicals and chemical reactions.
— the process technology, which influences process con-

ditions and the hold up of chemicals and energy
— the material flow concept, which determines the necessary storage capacity for raw materials, intermediates and final products.

Minimisation of the risk potential in the course of process development is the most powerful tool for reducing the consequences because it eliminates the source. Many technical safety measures aim also at reducing the consequences but without reducing or eliminating the cause or potential, e.g. in explosion protection: explosion venting, explosion supression or pressure resistant construction leave the potential for energy release unchanged but reduce with high reliability the consequences of an explosion. This type of consequence reduction often requires constant attention and maintenance in order to keep it effective.

Reduction of consequences with all its advantages is not in all cases practically feasible. In such situations the powerful and sophisticated methods for improving reliability or reducing probability serve an important purpose.

REDUCTION OF PROBABILITY. R. Papp, Atochem, F.

The chemical industry, as many other human activities, has a must: controlling the technological risks associated with its activity. Because the products handled are often hazardous, the operations involve in many cases high energy levels, risk control needs, specific techniques, procedures and overall rigour, key to plant safety. The chemical industry has made considerable efforts and devoted substantial financial resources to the solution of safety and environmental problems. It needs to go on doing all that is technically possible, economically reasonable, and legally required.

However, expressions such as "total safety" or "risk free" are practically meaningless. The idea of risk free is utopic, and not only in the chemical industry. Risk is normally defined by the potential hazard and the probability of the hazard to happen. It is clear that higher is the potential hazard, lower must be the probability of the event. Many methods have been developed in order to estimate such probability. Such methods will be reviewed in this presentation.

These methods are developed in order to be applicable in the various steps of ensuring safety. They intend to take all necessary measures in the design, construction, operation and maintenance of the production units. Each step needs different techniques to be applied. A key point overall is the identification of the potential hazards and their causes. It is obvious that an unknown hazard will never be properly controlled. Here again, several techniques, including highly elaborated procedures, laboratory techniques and computer simulations, have been developed since 15 years, techniques which shall be reviewed in this presentation. Reducing probability of hazard involves sometimes the use of qu tification. The help and limits of such quantification will discussed.

SAFETY MANAGEMENT. P. de Voogd, Shell Internat nale Chemie Maatschappij B.V., NL.

The paper will include:

— A review of issues which have to be managed for safe in the manufacturing chemicals.

— Installations. The technical aspects: process chemistr physical conditions, process safeguards, technical inte rity of the equipment, facilities for dealing with unwant excursions are all part of the intrinsic safety to be co ered at the design stage. During the lifetime of the insta lation, the safety has to be maintained and where possib improved. This requires regular reviews, inspection equipment, proper maintenance and upgrading. As mar of these technical aspects will be subject of other present tions during the workshop, this paper will only brief discuss them but will highlight aspects to take into co sideration in various countries.

— Interface. The installations must be user friendly: ergo nomics will define good operability, access, informatio presentation. The people operating and maintaining th installation must be trained in understanding the proces and the limits of the equipment, in what can go wron and how to prevent it. Research is presently being con ducted to reduce the likelihood and extent of human erro

— People. Everyone working for a company — manager technologists, operators, etc. — need to be committed t giving safety first priority. An essential feature of a goo safety management programme is to create a culture i which everybody adopts a behaviour of safety first in thei task and in fact in day to day life. The experience in Shel is that enhancement of safety has resulted in reductio of the number of worker injuries. The high attention t safety is also expected to result in lower technical risk through more reliable designs, more reliable installation and fewer operational errors.

STEWARDSHIP OF CHEMICAL PRODUCTION RISKS. W.W. Lowrance, The Rockefeller University, New York, USA.

A few "risk" basics

Risk is a compound estimate of likelihood and severity of harm. A key to dealing with risks is recognising three separable modes of analysis and action:

Risk assessment, *description* of the likelihood and severity of threat;

Risk appraisal, *evaluation* of the personal or societal burden from the risk, the costs required for protection, and the payback expected from risk-reduction investment; and

Risk response, *prescription* of "what to do about" the risk.

hese modes are distinguishable but interrelated. **Risk essment** finds facts; **risk appraisal** weighs consequen- of the facts in light of personal and social values; and **response** makes action-decisions based on the facts, ues, and pragmatics.

ining boundaries

he outcomes of all risk analyses are very sensitive to the ndaries that are adopted (such as which issues are con- ered) and the analytic assumptions that are incorporated. chemical industries, typical bounding issues include: ope- ons limits (for instance, are transport risks to be included?); use or abuse risk-causes; associated physical risk-causes; ociated natural catastrophic risk-causes; routine chemical eases; wastes; catastrophic chemical releases; subjects at k; environments at risk; social structures at risk; deriva- e effects; and time horizons.

The establishing of these boundaries and assumptions — ich gives guidance to engineers and economists who per- m the analyses, and which sets the ground for social debate er the specifics — clearly is an ethical and political matter. e of the principal values of regulatory and public review analyses is debating these defining issues.

e social riskbearing context

All of these matters are of concern not only to directly fected people, such as plant employees, and to "the public" d its representatives and surrogates, but also to plant man- ers and government officials who must exercise civic duty. oncerned citizens may well be seeking, not detailed debate specific questions, but general reassurance.

The broader contexting questions include:

Generally, is the production activity worthwhile and responsible?

Has every reasonably-expectable precaution been taken to reduce the risks?

Are the risks similar to other, familiar and routinely-borne risks; or are they strange or exceptionally high?

Are the people potentially at risk informed of the risks, and of how to take personal precautions? And have the people most at risk consented to bear the risks?

* Do those who bear the risks, benefit from the activity that generates the risks (or willingly accept compensation from those who benefit)?
* Are the authorities in charge of managing the activity and controlling its risks competent, honest, well-intentioned, and trustworthy?
* Is demonstrable progress being made in managing the risks better?

Many of these can be answered in commonsense language. Debates may center around "worthwhileness", "reasonably expectable precaution", and informed consent. Social justification of chemical production must center on reducing the risks to very low levels *so as to accrue the societal benefits.* All risk-reduction efforts should be viewed as societal investments.

A major difficulty for chemical enterprises is that because most members of the public lack firsthand experience with primary production, they fail to appreciate the importance of producing the commodity, intermediate, and fine chemicals that are required for securing the agricultural, transportation and other benefits that they are avid consumers of. Every possible effort should be made to remedy this unawareness.

Chemical production stewardship

These chemical issues now are public issues. In recent years a number of very constructive social experiments and institutional reforms have been undertaken (to be described). The following practices can help foster an atmosphere of trust and responsible progress:

* Proceed openly, in consultation with affected communities.
* "Frame" the issues sensitively. Because the answers derive from very different sources, distinguish among elements of assessment, appraisal, and response. Encourage the involved and affected parties to articulate their questions and concerns.
* Seek agreement on procedures for resolving any contended technical issues.
* Provide genuine opportunities for citizen participation. Recruit nonadversarial participants to "fill the middle" between extreme views. Involve teachers, physicians, or other citizen-experts in helping frame and interpret the issues.
* Involve civic groups, professional organisations, dispute-resolution organisations, or university groups, to provide expertise and broaden representation.
* As improvements are made in managing risks, inform the public.

CCUPATIONAL HYGIENE

An essential component of risk management

M. GUILLEMIN, University of Lausanne, Switzerland
R. ROTH, Sandoz AG, Basel, Switzerland

ıtroduction

Hazards in the occupational environment are of multiple ature. Their origins, sources, impacts and consequences on fe, health or material may be extremely different and sometimes very complex to assess or to anticipate. The control nd the management of these hazards require such a large mount of knowledge and experience in various fields that multidisciplinary team approach is necessary.

This paper will present the nature and the role of the science alled "occupational hygiene" in the general framework of isk management in the chemical industry. It should be tressed that such a presentation cannot be comprehensive nd will be limited to a few relevant key elements aiming t the illustration of the importance and the usefulness of ccupational hygiene in the management and control of azards. Focus on chemical hazards appears to be appropiate in this context but does not mean that occupational ygiene is restricted to these ones. The purpose of this paper s to provide the "educators" in the chemical industry or in niversities with a simple document introducing occupational ygiene as a necessary tool for managing health and safety n the chemical production.

Definition of occupational hygiene

The International Association of Occupational Hygiene IOHA) has adopted the following definition:

"Occupational Hygiene is the discipline of anticipating, ecognizing, evaluating and controlling health hazards in the working environment with the objectives of protecting worker ealth and well-being and safeguarding the community at arge". This definition helps to understand which type of hazards may be controlled and managed by this science and by which approach. In principle, these hazards and stresses should be measurable so that they may be objectively assessed and evaluated as far as their health risk (both acute and chronic) is concerned. The basic approach described in this definition is divided in three major steps:

1. anticipation/recognition (detection)
2. evaluation (assessment)
3. control (correction or prevention).

Moreover this definition stresses that occupational hygiene is also concerned by the community as a whole. This means that the control of pollutants and hazards inside the factory must take into account the protection of the environment by eliminating (substitution, retention, destruction) the potential air, water or soil contaminants at their source instead of emitting them in the evironment. An appropriate risk analysis and hazard evaluation at the workplaces will also help to avoid catastrophic events and therefore will protect the surrounding population. This important aspect of occupational hygiene has often been underestimated.

"Occupational hygiene is a science which protects both the workers and the environment". According to a document of the World Health Organization [1], "an occupational hygienist is a person with a university degree in engineering, physics or chemistry or an equivalent science degree (in some countries, medicine), and, in addition, with specialized training in recognition (identification of hazards and understanding of their effects on health of humans and their well-being), evaluation (characterization of hazards from qualitative and quantitative points of view) and controlpreventive measures) of hazards that arise in or out of the workplace and may cause imparied health or significant discomfort among workers or inhabitants of the surrounding community".

Role and function of occupational hygiene

Safety usually refers to the accident prevention and hygiene to the prevention of diseases or discomfort. This difference between safety and hygiene, although useful in designing different fields of knowledge, may also appear somewhat arbitrary. Safety may not be limited to fire, explosion or accident prevention and may encompass also prevention of long term hazards leading to chronic diseases. On the other side, occupational hygiene may include in its activities: fire, explosion or accident prevention and certainly includes the control of acute risk such as intoxication, narcosis or strong irritation which are accidents. Occupational medicine has the same objectives as occupational hygiene (protection of the workers' health) and uses a complementary approach by focusing its attention onto the worker in order to insure that his or her job fits his or her specific physiological and psychological conditions and will not impair his or her health with time.

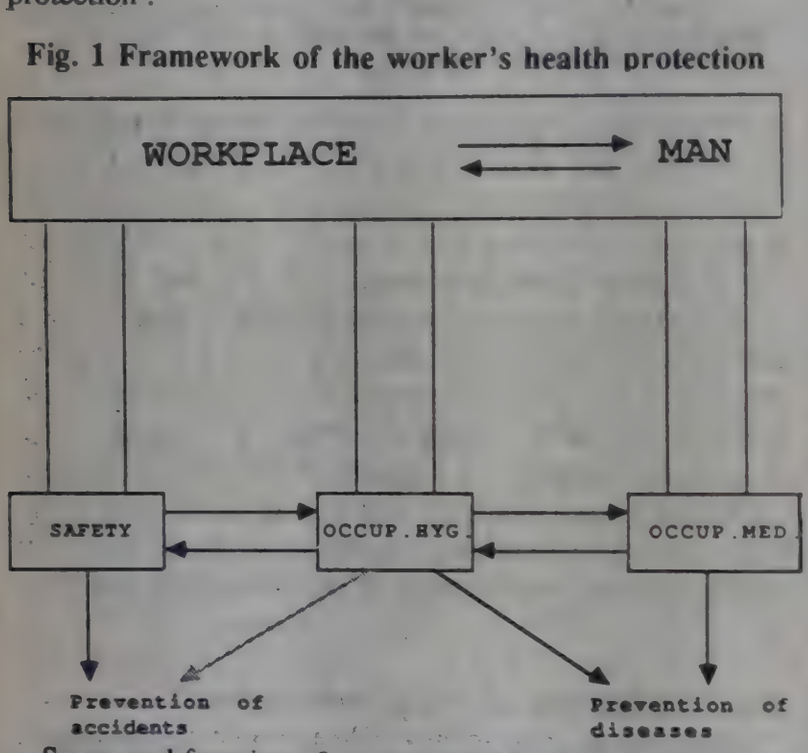
From this it is clear that occupational hygiene holds quite a privileged position in the multidisciplinary team in charge of controlling and managing the hazards in the chemical industry. The occupational hygienist who focusses his/her attention onto the workers' environment finds in the occupa-

* Paper presented at the IUPAC-Workshop on Safety in Chemical Production, September 9-13, 1990.

tional physician the necessary partner to reach their common goal. He is also a privileged partner of the other persons in charge of safety or environmental protection since the problems encountered in the occupational environment often concern simultaneously hygiene, safety and ecology. In other words, the occupational hygienist plays an important role of coordination between the different disciplines of such teams and may also act as a catalyst to the cross-fertilization which occurs in a multidisciplinary approach of the problems.

Figure 1 illustrates one of the aspects of the privileged position of occupational hygiene in the field of workers' health protection[2].

Fig. 1 Framework of the worker's health protection



Scope and function of occupational hygiene is obviously not limited to the three steps described above but include a lot of other important tasks as advice on planning and organization of work, participation in the development of programs to improve the workplace conditions, training and education of all the people involved, dissemination of information, etc.[3].

The role of occupational hygiene in the process of risk assessment and in the field of risk management is determining and esential in the chemical industry because the majority of the hazards are of chemical nature and concern the problems specific to that science which is obviously the most appropriate to keep these risks under control.

Basic approach of a specific problem

By the way of typical situation in a chemical industry we will illustrate how an occupational hygienist will approach a given problem. It should be stressed again that this example will only present a few very limited aspects of the role of an occupational hygienist. The situation to investigate is the production of a chemical, in a typical production line consisting of different vessles (mixture, reaction,...) and uni (filtration, drying,...). The problem to solve is to know the health risk due to chemicals for the workers occupie with this production in its normal use (abnormal even or accidents being another problem here) is acceptable not.

Anticipation-recognition

The hygienist must gain accurate knowledge about thi manufacturing process and collect information about all th chemicals involved in this production including by-products impurities, wastes etc. Besides the usual physical and chem ical properties of the substances such as flash point, explo sive limits, flammability, evaporation rate, vapour pressure and so on, other useful informations should also be collecte (Table 1), as well as an estimation of the amounts involved

Table 1
Useful informations related to chemical substances for assessing their health risk

Acute	Chronic
Minimum anesthetic concentration	Solubility in water and fat (oil)
Irritation threshold	Metabolism pathways/clearance
Chemical reactivity	routes
Odor threshold	Pharmacokinetic/pharmacodynamic data
Level immediately dangerous to health	Permissible exposure level, biological exposure indices
Short term exposure limit	Acceptable daily intake
Lethal dosis	. . . . .
. . . . .	

Note: Some information may be related to both acute and chronic risks

Through careful observations and surveys of the workplaces, through qualitative preliminary hazard analysis and with the help of all the other relevant information available (inspection or audit reports, incident or accident statistics and analysis, routine monitoring of the process, medical information about the workers, etc.), the hygienist and his team composed of the concerned person (production manager, occupational physician, chemist, process engineer, foreman, etc.) will identify the workplaces where potential health risks do exist.

This first step may be quite difficult to achieve, but is of utmost importance since any undetected hazard will remain

ıe workers (failure of the prevention).

uation-risk assessment

our example, the risk assessment will rely on the expo- assessment since we have restricted the problem to the ıical hazards. The hygienist will use his/her professional ement for each situation with a potential health risk, to rmine if the risk is obviously so low that it can be pted without further investigations or if it is obviously igh that immediate corrective action is needed. For all other situations where a clear decision cannot be taken, risk (exposure) has to be evaluated. Three methods come consideration for this evaluation.[4].

.. **Ambient monitoring** is the measurement and assess- nt of agents at the workplace to evaluate ambient expo- e and health risk compared to an appropriate reference

3. **Biological monitoring** is the measurement and assess- nt of workplace agents or their metabolites either in tis- s, secreta, excreta, expired air or in any combination of se to evaluate exposure and health risk compared to an ropriate reference

C. **Health surveillance** is the periodic medico- ysiological examinations of exposed workers with the ective of protecting health and preventing occupationally ated disease.

These three methods have their own advantages and lim- tions and should be used simultaneously whenever pos- le. However, it should be emphasized that the biological nitoring is, at the moment, limited to a few agents (approx- ately less than 40). The health surveillance carried out by occupational physician is a very important part of the risk sessment because it allows to detect early reversible signs health effects or biological response (when the appropı- te tests and medical investigations have been selected) ıich may occur in sensitive individuals or in situations ıere a complex exposure pattern has produced unexpected nergistic effects.

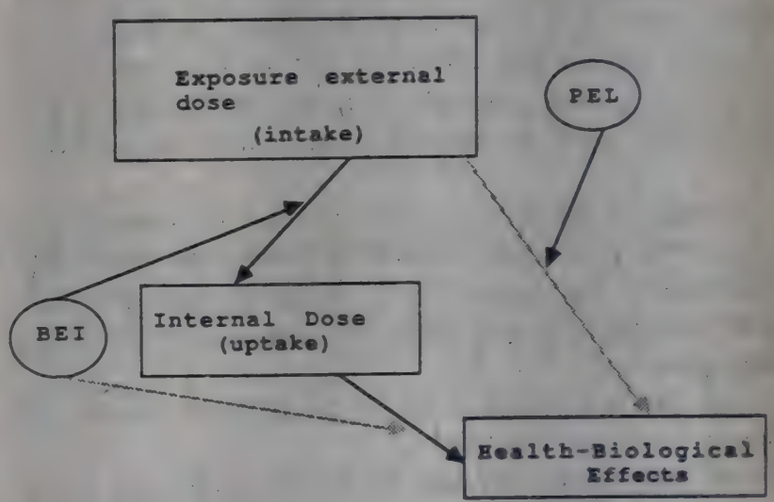
The hygienist's skill for ambient exposure assessment will used here to set up an appropriate sampling strategy includ- g the selection of an adequate analytical method or the use a reliable direct reading instrument.

The choice of the sampling method (either stationary or ersonal), the duration of the sampling, the number of work- s involved, the location of the fixed stations, the type of ata handling, the possible external and internal interactions, e pharmacological and toxicological properties of the con- dered chemical, the relevance of the chosen index to mon-

etc. will be taken into consideration in this very critical phase of the risk asseseement[5]. The possibility of skin resorption and ingestion through comtaminated skin (fingers, lips) has to be taken into consideration in order to assess the internal dose received by the worker. This is where the biological monitoring may be quite helpful.

Figure 2 summarizes the interlationships between the three monitoring methods and their usual associated "reference values". Permissible exposure level (PEL) and Biological Exposure index (BEI) are usual "reference values".

Figure 2
Interrelationship between the different monitoring methods
Permissible expsoure level (PEL) and Biological Exposure index (BEI) are usual "reference values".



When the exposure has been reliably assessed the health risk has to be evaluated to know if it can be considered as acceptable or not. When an "appropriate" reference value does exist, such as a permissible exposure level or a biological exposure index (which may be a legal requirement or a simple recommendation), the interpretation is rather easy since this value represents the acceptable risk. But even in these "simple cases" the collaboration with a physician is necessary to take into account the numerous factors which can play a role in assessing the health risk for a given individual (physiological characteristics, like style, drugs consumption, health status, and so on).

In the other cases, where the reference value is not straightforward an estimation may be done by an extrapolation of the other reference values or of the toxicological data such as "Acceptable Daily Intake" (ADI) "No Observable Exposure Level" (NOEL), "Lethal Concentration" (LC) "Immediately Dangerous to Life or Health" (IDLH) levels, etc. To derive an acceptable risk from these values is a difficult task; requires good knowledge in toxicology and should

also be done as a team work after careful considerations and keeping in mind that such assessment will derive much more "fragile" reference values than those based on good epidemiologic studies. Our knowledge in this field being yet very poor, a reliable risk assessment becomes rapidly impossible in case of complex mixtures where no information is available about the health effect of this precise mixture or about the possible external and internal interactions (synergism, antagonism,). Prevention, in these cases, implies to minimize the exposure as much as practically possible.

Control and risk-management

If the risk has been found unacceptable, it must be either eliminated (change of substances or process) or diminished to an acceptable level. This "sanitation" phase is again a team work where the occupational hygienist plays quite an important role. The possibilities to limit the exposure of the workers are usually numerous and should be chosen according to their best cost/benefit ratio. Automation, enclosure, ventilation, are among the usual preventive measures. The hygienist will test their efficiency and set up a maintenance programme as well as periodic or continuous monitoring programme to insure an adequate protection of the workers.

In some countries, such as in the USA, the occupational hygienists recommend to consider half the permissible exposure value as the "action level". In other words above this level, sanitation has to be done. This strategy is based on two important facts:

1. exposure assessment is not always perfectly reliable and higher levels are possible
2. the permissible exposure levels are usually not severe enough since most of the time they are corrected on the low side (Lowering the PEL).

The risk management[6] involves much more than the ris assessment and the preventive measures described here, b is out of the scope of this paper.

Conclusion

Through a limited and superficial presentation of a fe keys elements of occupational hygiene, the invaluable con tribution of this discipline for the risk management in th chemical industry has been shown.

References:

1. 8th Report of the joint ILO/WHO Committee on Occupational Healt "Education and Training in Occupational Health, Safety and Ergonom ics" Techn. Rep. Series 663, WHO, Geneva 1981.
2. M.P. Guillemin "Why is industrial hygiene lagging behind?" in Edu cation and Training Policies in Occupational Safety and Health and Ergo nomics. Occupational Safety and Health Series No. 47 International Labou Office (ILO) Geneva 1982, p. 59-63.
3. M. Lippman "Conference working group reports: need, scope and func tion" in Training and Eduction in Occupational Hygiene: An Interna tional Perspective Eds. M. Corn and J.K. Corn. Annals of the American Conference of the Governmental Industrial Hygienists (ACGIH) Cincinnati, Ohio 1988, p. 79-81.
4. A. Berlin, R.E. Yodaiken and B.A. Herman Eds. "Assessment of Toxic Agents at the Workplace". Commission of the European Communities Martinus Nijhoff Publ. Brussels-Luxemburg, 1984.
5. N.A. Leidel, K.A. Bush and J.R. Lynch "Occupational Exposure Sampling Strategy Manual" US Dept. of Health, Education and Welfare, National Institute of Occupational Safety and Health, Cincinnati Ohio, 1977.
6. J.T. Garret, L.J. Cralley and L.V. Crolley Eds. "Industrial Hygiene Management" John Wiley and Sons, New York, 1988.

CCUPATIONAL HYGIENE

An essential component of risk management

M. GUILLEMIN, University of Lausanne, Switzerland
R. ROTH, Sandoz AG, Basel, Switzerland

ntroduction

Hazards in the occupational environment are of multiple ature. Their origins, sources, impacts and consequences on fe, health or material may be extremely different and sometmes very complex to assess or to anticipate. The control nd the management of these hazards require such a large mount of knowledge and experience in various fields that multidisciplinary team approach is necessary.

This paper will present the nature and the role of the science alled "occupational hygiene" in the general framework of sk management in the chemical industry. It should be tressed that such a presentation cannot be comprehensive nd will be limited to a few relevant key elements aiming t the illustration of the importance and the usefulness of ccupational hygiene in the management and control of azards. Focus on chemical hazards appears to be appropiate in this context but does not mean that occupational ygiene is restricted to these ones. The purpose of this paper s to provide the "educators" in the chemical industry or in niversities with a simple document introducing occupational ygiene as a necessary tool for managing health and safety n the chemical production.

Definition of occupational hygiene

The International Association of Occupational Hygiene IOHA) has adopted the following definition:

"Occupational Hygiene is the discipline of anticipating, ecognizing, evaluating and controlling health hazards in the vorking environment with the objectives of protecting worker ealth and well-being and safeguarding the community at arge". This definition helps to understand which type of azards may be controlled and managed by this science and by which approach. In principle, these hazards and stresses should be measurable so that they may be objectively assessed and evaluated as far as their health risk (both acute and chronic) is concerned. The basic approach described in this definition is divided in three major steps:

1. anticipation/recognition (detection)
2. evaluation (assessment)
3. control (correction or prevention).

Moreover this definition stresses that occupational hygiene s also concerned by the community as a whole. This means that the control of pollutants and hazards inside the factory must take into account the protection of the environment by eliminating (substitution, retention, destruction) the potential air, water or soil contaminants at their source instead of emitting them in the evironment. An appropriate risk analysis and hazard evaluation at the workplaces will also help to avoid catastrophic events and therefore will protect the surrounding population. This important aspect of occupational hygiene has often been underestimated.

"Occupational hygiene is a science which protects both the workers and the environment". According to a document of the World Health Organization [1], "an occupational hygienist is a person with a university degree in engineering, physics or chemistry or an equivalent science degree (in some countries, medicine), and, in addition, with specialized training in recognition (identification of hazards and understanding of their effects on health of humans and their well-being), evaluation (characterization of hazards from qualitative and quantitative points of view) and controlpreventive measures) of hazards that arise in or out of the workplace and may cause imparied health or significant discomfort among workers or inhabitants of the surrounding community".

Role and function of occupational hygiene

Safety usually refers to the accident prevention and hygiene to the prevention of diseases or discomfort. This difference between safety and hygiene, although useful in designing different fields of knowledge, may also appear somewhat arbitrary. Safety may not be limited to fire, explosion or accident prevention and may encompass also prevention of long term hazards leading to chronic diseases. On the other side, occupational hygiene may include in its activities: fire, explosion or accident prevention and certainly includes the control of acute risk such as intoxication, narcosis or strong irritation which are accidents. Occupational medicine has the same objectives as occupational hygiene (protection of the workers' health) and uses a complementary approach by focusing its attention onto the worker in order to insure that his or her job fits his or her specific physiological and psychological conditions and will not impair his or her health with time.

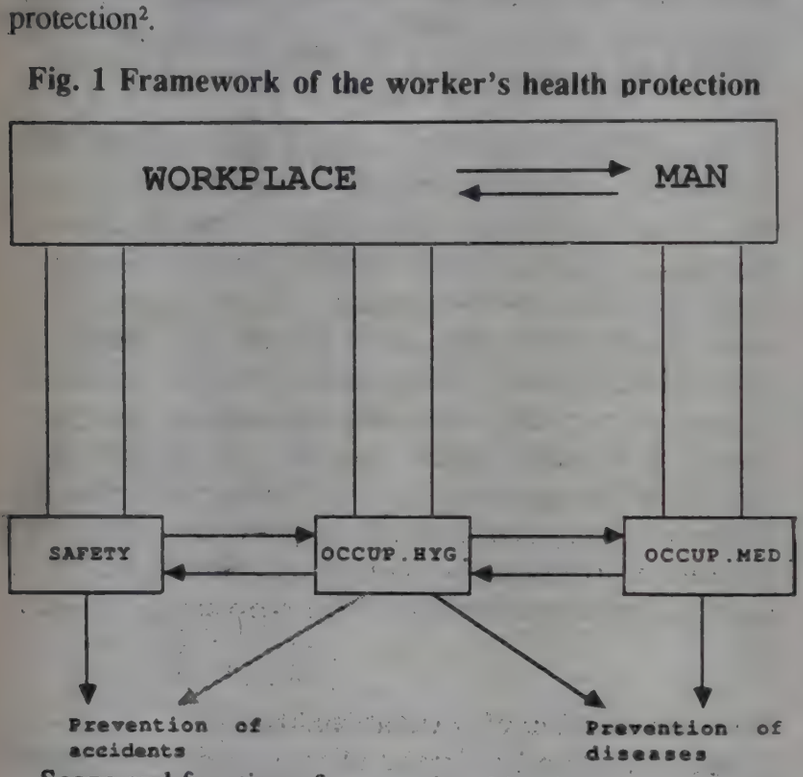
From this it is clear that occupational hygiene holds quite a privileged position in the multidisciplinary team in charge of controlling and managing the hazards in the chemical industry. The occupational hygienist who focusses his/her attention onto the workers' environment finds in the occupa-

* Paper presented at the IUPAC-Workshop on Safety in Chemical Production, September 9-13, 1990.

tional physician the necessary partner to reach their common goal. He is also a privileged partner of the other persons in charge of safety or environmental protection since the problems encountered in the occupational environment often concern simultaneously hygiene, safety and ecology. In other words, the occupational hygienist plays an important role of coordination between the different disciplines of such teams and may also act as a catalyst to the cross-fertilization which occurs in a multidisciplinary approach of the problems.

Figure 1 illustrates one of the aspects of the privileged position of occupational hygiene in the field of workers' health protection[2].

Fig. 1 Framework of the worker's health protection



Scope and function of occupational hygiene is obviously not limited to the three steps described above but include a lot of other important tasks as advice on planning and organization of work, participation in the development of programs to improve the workplace conditions, training and education of all the people involved, dissemination of information, etc.[3].

The role of occupational hygiene in the process of risk assessment and in the field of risk management is determining and esential in the chemical industry because the majority of the hazards are of chemical nature and concern the problems specific to that science which is obviously the most appropriate to keep these risks under control.

Basic approach of a specific problem

By the way of typical situation in a chemical industry we will illustrate how an occupational hygienist will approach a given problem. It should be stressed again that this example will only present a few very limited aspects of the role of an occupational hygienist. The situation to investigate is the production of a chemical, in a typical production li- sisting of different vessles (mixture, reaction,...) and unit (filtration, drying,...). The problem to solve is to know i the health risk due to chemicals for the workers occupie with this production in its normal use (abnormal event or accidents being another problem here) is acceptable o not.

Anticipation-recognition

The hygienist must gain accurate knowledge about thi manufacturing process and collect information about all the chemicals involved in this production including by-products impurities, wastes etc. Besides the usual physical and chemical properties of the substances such as flash point, explosive limits, flammability, evaporation rate, vapour pressure and so on, other useful informations should also be collected (Table 1), as well as an estimation of the amounts involved.

Table 1
Useful informations related to chemical substances for assessing their health risk

Acute	Chronic
Minimum anesthetic concentration	Solubility in water and fat (oil)
Irritation threshold	Metabolism pathways/clearance
Chemical reactivity	routes
Odor threshold	Pharmacokinetic/pharmacodynamic data
Level immediately dangerous to health	Permissible exposure level, biological exposure indices
Short term exposure limit	Acceptable daily intake
Lethal dosis	. . . . .
. . . . .	

Note: Some information may be related to both acute and chronic risks

Through careful observations and surveys of the workplaces, through qualitative preliminary hazard analysis and with the help of all the other relevant information available (inspection or audit reports, incident or accident statistics and analysis, routine monitoring of the process, medical information about the workers, etc.), the hygienist and his team composed of the concerned person (production manager, occupational physician, chemist, process engineer, foreman, etc.) will identify the workplaces where potential health risks do exist.

This first step may be quite difficult to achieve, but is of utmost importance since any undetected hazard will remain

he workers (failure of the prevention).

luation-risk assessment

n our example, the risk assessment will rely on the expo- assessment since we have restricted the problem to the mical hazards. The hygienist will use his/her professional gement for each situation with a potential health risk, to ermine if the risk is obviously so low that it can be epted without further investigations or if it is obviously high that immediate corrective action is needed. For all other situations where a clear decision cannot be taken, risk (exposure) has to be evaluated. Three methods come o consideration for this evaluation.[4].

A. Ambient monitoring is the measurement and assess- nt of agents at the workplace to evaluate ambient expo- e and health risk compared to an appropriate reference

B. Biological monitoring is the measurement and assess- nt of workplace agents or their metabolites either in tis- es, secreta, excreta, expired air or in any combination of ese to evaluate exposure and health risk compared to an propriate reference

C. Health surveillance is the periodic medico- ysiological examinations of exposed workers with the jective of protecting health and preventing occupationally lated disease.

These three methods have their own advantages and lim- tions and should be used simultaneously whenever pos- ble. However, it should be emphasized that the biological onitoring is, at the moment, limited to a few agents (approx- nately less than 40). The health surveillance carried out by e occupational physician is a very important part of the risk ssessment because it allows to detect early reversible signs f health effects or biological response (when the appropate tests and medical investigations have been selected) hich may occur in sensitive individuals or in situations here a complex exposure pattern has produced unexpected ynergistic effects.

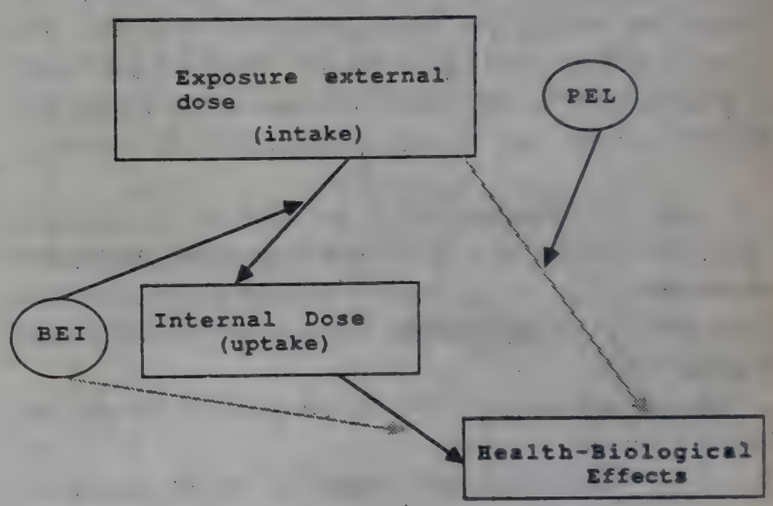
The hygienist's skill for ambient exposure assessment will e used here to set up an appropriate sampling strategy includng the selection of an adequate analytical method or the use f a reliable direct reading instrument.

The choice of the sampling method (either stationary or ersonal), the duration of the sampling, the number of workrs involved, the location of the fixed stations, the type of ata handling, the possible external and internal interactions, he pharmacological and toxicological properties of the conidered chemical, the relevance of the chosen index to mon-

etc. will be taken into consideration in this very critical phase of the risk asseseement[5]. The possibility of skin resorption and ingestion through comtaminated skin (fingers, lips) has to be taken into consideration in order to assess the internal dose received by the worker. This is where the biological monitoring may be quite helpful.

Figure 2 summarizes the interlationships between the three monitoring methods and their usual associated "reference values". Permissible exposure level (PEL) and Biological Exposure index (BEI) are usual "reference values".

Figure 2
Interrelationship between the different monitoring methods
Permissible expsoure level (PEL) and Biological Exposure index (BEI) are usual "reference values".



When the exposure has been reliably assessed the health risk has to be evaluated to know if it can be considered as acceptable or not. When an "appropriate" reference value does exist, such as a permissible exposure level or a biological exposure index (which may be a legal requirement or a simple recommendation), the interpretation is rather easy since this value represents the acceptable risk. But even in these "simple cases" the collaboration with a physician is necessary to take into account the numerous factors which can play a role in assessing the health risk for a given individual (physiological characteristics, like style, drugs consumption, health status, and so on).

In the other cases, where the reference value is not straightforward an estimation may be done by an extrapolation of the other reference values or of the toxicological data such as "Acceptable Daily Intake" (ADI) "No Observable Exposure Level" (NOEL), "Lethal Concentration" (LC) "Immediately Dangerous to Life or Health" (IDLH) levels, etc. To derive an acceptable risk from these values is a dif-

also be done as a team work after careful considerations and keeping in mind that such assessment will derive much more "fragile" reference values than those based on good epidemiologic studies. Our knowledge in this field being yet very poor, a reliable risk assessment becomes rapidly impossible in case of complex mixtures where no information is available about the health effect of this precise mixture or about the possible external and internal interactions (synergism, antagonism,). Prevention, in these cases, implies to minimize the exposure as much as practically possible.

Control and risk-management

If the risk has been found unacceptable, it must be either eliminated (change of substances or process) or diminished to an acceptable level. This "sanitation" phase is again a team work where the occupational hygienist plays quite an important role. The possibilities to limit the exposure of the workers are usually numerous and should be chosen according to their best cost/benefit ratio. Automation, enclosure, ventilation, are among the usual preventive measures. The hygienist will test their efficiency and set up a maintenance programme as well as periodic or continuous monitoring programme to insure an adequate protection of the workers.

In some countries, such as in the USA, the occupational hygienists recommend to consider half the permissible exposure value as the "action level". In other words above this level, sanitation has to be done. This strategy is based on two important facts:

1. exposure assessment is not always perfectly reliable and higher levels are possible
2. the permissible exposure levels are usually not severe enough since most of the time they are corrected on the low side (Lowering the PEL).

The risk management[6] involves much more than the ri assessment and the preventive measures described here, b is out of the scope of this paper.

Conclusion

Through a limited and superficial presentation of a fe keys elements of occupational hygiene, the invaluable co tribution of this discipline for the risk management in th chemical industry has been shown.

References:

1. 8th Report of the joint ILO/WHO Committee on Occupational Healt "Education and Training in Occupational Health, Safety and Ergonom ics" Techn. Rep. Series 663, WHO, Geneva 1981.
2. M.P. Guillemin "Why is industrial hygiene lagging behind?" in Edu cation and Training Policies in Occupational Safety and Health and Ergo nomics. Occupational Safety and Health Series No. 47 International Labou Office (ILO) Geneva 1982, p. 59-63.
3. M. Lippman "Conference working group reports: need, scope and func tion" in Training and Eduction in Occupational Hygiene: An Interna tional Perspective Eds. M. Corn and J.K. Corn. Annals of the American Conference of the Governmental Industrial Hygienists (ACGIH) Cincinnati, Ohio 1988, p. 79-81.
4. A. Berlin, R.E. Yodaiken and B.A. Herman Eds. "Assessment of Toxic Agents at the Workplace". Commission of the European Communities, Martinus Nijhoff Publ. Brussels-Luxemburg, 1984.
5. N.A. Leidel, K.A. Bush and J.R. Lynch "Occupational Exposure Sampling Strategy Manual" US Dept. of Health, Education and Welfare, National Institute of Occupational Safety and Health, Cincinnati Ohio, 1977.
6. J.T. Garret, L.J. Cralley and L.V. Crolley Eds. "Industrial Hygiene Management" John Wiley and Sons, New York, 1988.

International Market Update

TAKEOVER OF TIOXIDE OMPLETE

CI has acquired the 50% stake of the okson group, in Tioxide, the second gest producer of Titanium dioxide in world (Dupont is the largest). ICI eported to have obtained the shares a song but faces the prospect of ending as much as £250 million in aning up several plants und updating hnologies with all but one of Tiox- s plant based on the elder sulphate ite, putting it at an disadvantage ainst DuPont, whose plants are based the more acceptable chloride route.

Fortunes in the titanium dioxide bus- ess have been fluctuating and the out- ok in the medium term is only timistic. Worldwide capacity for anium dioxide, under the Tioxide bel is around 510,000 mt/year with ne plants located in U.K. (2), Europe), North America (1), South Africa), Malaysia (1) and New Zealand (1).

S PLASTICS ON THE RISE

Increasing prices of feedstocks viz. hylene, propylene, styrene and vinyl loride have pushed up prices of most ermoplastics from November 1, with rther increases anticipated in ecember. (See Table Below).

Polyethylenes (low density and high nsity grades) have been increased by 5 cents/lb effective November 1 and polystyrene prices have also been upped by a similar amount.

TITANIUM DIOXIDE PRICES BRING RELIEF TO PAINT INDUSTRY

The paint industry hit hard by rising prices of inputs, particularly solvents has recently seen prices of titanium, dioxide known for constant movement upwards, stabilise and even begin to move downward.

Substantial capacity additions over the last few years, coupled with a downturn in markets have meant that US prices have come down to $1.03 per lb. In continental Europe prices range between DM 4.4-4.5/kg. and in U.K. prices are hovering below £1500/tonne. Far East prices are in the region of $2000/tonne, for fourth quarter deliveries, and is likely to be the one area which will see sustained growth.

FERTILISER PRICES IN PHILLIPINES REVISED

Fertiliser prices in the Phillipines have seen major revisions upward following the Gulf crisis. Urea recorded the biggest increase (46%) and prices quoted at around $10.55 for 50 kg. bag. Ammonium sulphate was up 15% to $5.80 a bag while ammonium phosphate went up by 12.6% to $9.35 per bag.

SOUTH KOREA ALLEGES DUMPING OF POLYACETALS

Korean Engineering Plastics, having a 70% market of the domestic polyacetal business has accused DuPont, Hoechst-Celanese and Asahi Chemicals of dumping material in the country's first ever anti-dumping investigation. The Korean firm has a capacity to make 20,000 tonne/year of material, while domestic demand is placed at around 18,000 tonnes/year. Another South Korean concern, Lucky is building the country's second polyacetal plant, and markets are expected to hot up.

PVC GROWTH TO LEVEL OFF

Worldwide growth in PVC, will level off to around 3.1%/year in the period 1989-1995 according to a recent study by Tecnon. Five factors will determine the pace and these include: environment, recycling, European markets, the Gulf crisis and new applications.

On the environmental front, PS will attract greater flak, and pressures on PVC will diminish. Recycling will reduce growth and affects will be felt particularly in developed markets. Eastern Europe holds considerable potential for expansion of sales.

Growth is expected to the above average in Latin America (6.9%/year), the Middle East (5.3%/year), Africa (5%/year) and the Asia-Pacific region (4.7%/year). Details are given in table below:

EEDSTOCKS PUSH PLASTICS PRICES HIGHER
(in cents/lb)

	Aug. 22	Sept. 19	Oct. 17	Nov. 1
ow-density polyethylene (film grade)	36-38	36-38	41-43	46-48
igh density polyethylene (blow molding)	40-42	40-42	45-47	50-52
olypropylene (homo-injection)	37-40	39-42	39-42	40-44
olystyrene (general purpose)	48-50	48-50	55-58	59-62
olyvinyl chloride (pipe grade)	33-36	31-35	33-36	38-40

PVC CONSUMPTION FORECASTS
('000 tonne)

	1990	1992	1994
North America	4020	4175	4355
Latin America	1019	1180	1329
Western Europe	5150	5363	5556
Eastern Europe	1768	1869	1985
Africa	486	535	588
Middle East	350	397	444
Asia-Pacific	3207	3520	3887
Japan	1985	2070	2140
Total	17985	19119	20289

News About New Projects

BASF APPROVES CRACKER IN BELGIUM

In what will be it's largest ever capital investment, BASF has decided to go ahead with an $855 million cracker complex at Antwerp, to produce 600,000 tonne/year of ethylene, 350,000 tonne/year of polymer grade propylene and 220,000 tonnes/year of benzene from an aromatics unit.

The complex to be designed and built by Linde will handle either naphtha or LPG as feedstock. BASF is expected to use 400,000 tonne/year of ethylene at Antwerp itself and pipe the remaining ethylene to other plants in Europe.

Only recently Exxon had announced that it was dropping work on its Mosmorran cracker, explaining that the current economic slowdown did not warrant any further ethylene capacity.

EASTMAN DELAYS PET PROJECT IN U.K.

Eastman Chemicals, USA has postponed its plans to expand capacity of its PET project in the U.K. from 100,000 m.t./year to 200,000 m.t./year. The expansion to have been completed by 1992, will now be delayed, to go onstream end-1992, or early 1993. Uncertainty due to the Gulf crisis has been attributed to be the cause of the postponement. Shell has a similar project on hand, and although work is proceeding on the project, the company has not obtained full approval of the board. Prices of p-xylene and MEG, key raw materials for the polyester business have jumped up sharply since the start of the Gulf crisis.

DU PONT COMPLETES EPDM PILOT PLANT

Du Pont has nearly completely construction of a $1 million pilot plant for ethylene-propylene-diene-monomer in Texas. The plant will be used to experiment with methods to enhance production rates, alter moisture content and optimise the purity of its *Nordel* hydrocarbon rubber.

SABIC OKAYS MTBE PROJECT

SABIC, has approved National Methanol Co's, plans to build a 500,000 m.t./year MTBE plant in collaboration with Hoechst-Celanese and Texas Eastern. The board of SABIC has also approved Saudi European Petrochemical Co's plans to double MTBE ou to 1 million m.t./year. However bid for Eastern Petrochemicals linear density polyethylene plant has been off by three months to early 19 SABIC also confirmed plans to ahead with a 200,000 tonne/year gr roots polypropylene project, based Union Carbide's Unipol process.

PAKISTAN PLANNING ALCOHOL BASED PS FACILI

Polymers and Petrochemicals Pa stan has approved plans to set up 20,000 tonne styrene plant and a 15,(tonne polystyrene plant. Ethylene w be through ethanol from molasses a part benzene will be from local sour and the balance imported. The proje the first of it's kind, will be p financed by the Asian Developme Bank and will go onstream by m 1993. The plant is expected to fu cater to local requirements of PS.

THAILAND TO BUILD EPOXY RESINS UNIT

Thai Epoxy and Allied Products C plans to build a 10,000 tonne/year u to make make epoxy resins. The co pany is a joint venture between thr Birla group companies and the Japane Companies, Tohto-Kasei and Nissh Iwai. The unit is scheduled to g onstream in early 1992.

Environment

. CONGRESS PASSES EAN AIR ACT

he U.S. Congress has recently sed a new Clean Air Act, which will ose new controls on ozone-depleting micals, air toxics and acid rain. Sul-r dioxide emissions will be cut in f by 2000 AD, to 10 million tonnes ually; and nitrogen oxide emissions uced by 33% to 4 million tonnes ually, starting 1992. Coal burning lities will have to spend $ 3 billion ear to burn low sulphur fuel or install ubbers to comply with the provisions.

Passenger cars will have to emit 60% s nitrogen oxides and 40% less drocarbons starting 2003. This would quire installation of catalytic convert-s in almost all cars and oil companies ould have to develop new products, shing up fuel costs.

The output of 189 toxic chemicals are oposed to be reduced 90% by 2003, d most manufacturers would have to vest heavily in pollution control uipment. Even small businesses such drycleaning shops and auto repair ops will have to install pollution con-ol equipment.

CFC's and most other ozone destroy-g chemicals will have to be phased out 2000. Refrigeration and air-nditioner manufacturers, users of dustrial solvents and makers of foam sulation — will have to pay more for bstitutes. While EPA estimates the tal cost to industry at $ 25 billion/ ear, the Chemical Manufacturers ssociation places the cost at $40-$50 illion/year.

mpact on Chemical Industry

Most of the impact on the chemical ndustry will come from the move to ontrol 189 toxic or carcinogenic chem-cals through the installation of Maximum Achievable Control Technology (MACT) during the next ten years. The EPA will set MACT levels at the average of the cleanest 12% of plants in each of several categories, and how these categories are to be determined is expected to have profound impact especially on small plants. One provision allows companies to avoid the MACT requirement by cutting air toxics atleast 90% from 1987 levels by 1994.

The next stage of the clean-up calls for a study by the National Academy of Sciences, to determine the need of clean-up of residual risk, followed by additional measures to control risk to a level probably of 1 in 10,000 initially leading finally to a risk of 1-in-1 million.

GREENPEACE SUES ALBRIGHT & WILSON

In the first private action against a chemical company for environmental violations, Greenpeace has sued Albright & Wilson (London) for violating provisions of the Water Act of 1989. Greenpeace has charged that Albright & Wilson's detergent plant has released effluents containing high concentrations of four metals — copper, chromium, zinc and nickel, much in excess of consent levels. The company has replied that while concentrations of these metals in effluents were indeed higher, the total quantity of effluents still remained within permissible limits. Concentrations, the company claimed were higher since the dilution of waste streams had been contained following a water shortage. Greenpeace sources indicated that similar action was being contemplated on other firms in the U.K. as well.

ICI STARTS UP CFC REPLACEMENT FACILITY

ICI chemicals and polymers (Runcorn, U.K.) has begun production of MFC-134a, a substitute for CFC-12, at its plant in Runcorn, U.K., as part of a worldwide program to reduce CFC production. The company is building a much higher capacity plant in the U.S., and claims that its CFC production are 25-30% lower than levels required by the Montreal Protocol.

Meanwhile, ICI (USA) has put on hold further research into a bromine-based product 124B1, a new halon-alternative fire extinguisher, till the implications of the recently passed Clean Air Act by U.S. Congress becomes clearer.

EC PLANS TO TAX CARBON EMISSIONS

Plans to tax carbon emissions are being drawn up in Brussels as part of an ambitious EC environmental package to be unveiled next month.

Proposals for the first "green" fund financed from the EC budget, fiscal incentives to combat pollution, and an "ecolabelling" scheme for goods which meet high standards of environmental protection are among other measures being prepared.

Mr. Carlo Ripa Di Meana, the EC Environment Commissioner, is said to be determined to win commission approval for the ideas which he hopes will provide the foundations of his policy for the second half of his four-year mandate. All would subsequently need member state support.

Most of the issues have been under consideration for some time, but a significant spur to action was provided last month when the 18 nations of the EC and EFTA committed themselves to stabilising carbon dioxide and other greenhouse gases by the year 2000.

EC environmental experts believe that introduction of an energy tax is essential if this target is to be met. They argue that the current high oil price

presents an ideal opportunity. Full details of the plan have not yet been settled but one idea is that the tax would be increased as energy prices fall back closer to their pre-Gulf crisis levels. It would be related to the quantity of carbon emitted, so that for example coal would be more heavily penalised than oil, and oil would be hit harder than gas.

Other internal Brussels negotiations — concerning plans for a registration tax on lorries and a variable purchase tax on cars, related to their petrol consumption — are also at a delicate stage. Officials recognise that these proposals could trespass on member states' jealously guarded soverignty in the area of taxation.

The other two planks of the package, now taking shape — the EC environment fund and the eco-labelling scheme — will probably proceed through the commission with less debate. The fund idea has been a hobby horse of Mr. Ripa Di Meana, who seized on a proposal from the European parliament, in recent budget talks.

The ecolabelling scheme, meanwhile, has already been the subject of intense consultations with industry. It would involve the award of a kind of "green" badge for a restricted number of products that meet high environmental standards, on the lines of a scheme running in Germany. Food and pharmaceutical products would not be eligible, and makers of dangerous substances would also be excluded.

S.E. ASIA SHOWS THE WAY IN PHASING OUT CFCs

South-East Asia's newly industrialising countries are showing the way on phasing out ozone-depleting chlorofluorocarbons (CFCs) by announcing ambitious plans to switch to alternate chemicals. Beginning February 5, 1991, Singapore's Environmental Ministry will enforce a ban on the use of non-pharmaceutical aerosol products containing CFCs -- the chemicals that harm the earth's atmospheric ozone and enhance global warming.

The ban will include household products ranging from hair sprays to furniture polish. Even disposable crockery and wrappings using polystyrene-containing CFCs are out.

CFCs are used worldwide in refrigeration, cleaning and air conditioning. Attempts to get the world's major producers and users of CFCs to cut back have got snagged in debates about compensation to third world countries to make the transition to safer, but more expensive technologies.

Singapore has Asia's highest per capita income after Japan, and neighbouring resource-rich Malaysia has living standards nearly the same as Uruguay. Although major chemical manufacturers in Singapore have already come up with their own range of CFC-free products, effective substitutes for pharmaceutical use are less easily available. Two types of pharmaceutical aerosol sprays are exempt from the ban. Only 1.5 per cent of the world's tonnage of CFCs are used in medicines, according to the United Nations Environment Programme (UNEP).

Critics say Singapore is taking the easy way out. Aerosols consume just five per cent of the total CFC's used in the country. Industry, especially electronics, use up to 50 per cent — largely for cleaning purposes. Singapore and Malaysia are major centres for transnational semi-conductor firms which have used the region's cheaper hut highly-skilled labour for production of micro-circuits.

As for air-conditioning and refrigeration (35 per cent CFC consumption), substitutes for the former systems of less than 250 tonnes capacity, is available. But there isn't any alternative yet for CFC used in vehicle air conditioners. There has been progress in other areas. Singapore companies can now plug i Ozonet — a computerised data designed to give CFC users informat on substitute processes, materials technologies.

Singapore's Economic Developm Board has said it will give financ assistance to firms that seek to mod equipment or production processes conserve CFCs or adjust to substitut The Institute of Standards and Industr Research is also providing consultan services for analysing and evaluati CFC substitutes and non-CFC pr cesses.

Neighbouring Malaysia is to recei $ 10 million from the $ 240 million fu set up in Montreal to help the thi world make the transition to CFC-fr technologies. Malaysian officials ha pointed out that the biggest gain fro the proposed centre is that the "researc results will be available to all instead o being the property of a few whos motive is to make a profit out of poo countries".

Concern in Malaysia has hinged o the lower life expectancy likely to resul from ozone depletion. Noted skin spe cialist M. Ilyas of the University o Science in Kuala Lumpur says darke skin pigments have given people in the tropics a false sense of protection from the softer-effects of atmospheric ozone destruction.

Ozone depletion will allow in more ultra-violet rays, and scientists say this will lead to increased incidence of skin cancer. The Science, Technology and Environment Ministry of Malaysia is currently conducting a national study to identify current and future needs of CFCs and explore technology options and substitutes.

RICE FARMING LEADS TO POLLUTION PROBLEM

Rice is not only the staple food for nearly 3.7 billion people in the deve-

ng world, but its cultivation is owing up lot of pollution problems, entists at the recently concluded nposium on rice research—new fron- s said.

The International Rice Research tititute (IRRI) in Phillipines was nching a major project with the envi- mental protection agency (EPA) of ited States to evolve methods for nimising environmental fallouts of e cultivation, IRRI Director-General, . Klaus Lampse, said.

Dr. Lampse, told the symposium, ganised by the directorate of rice search, that the challenge before sci- tists was to ensure sustainable high elds and prevent rice from becoming e cause for deforestation and air pol- tion.

75 per cent of the fertilisers used in ce cultivation contributed more to pol- tion than improving yields, he pointed ut. Suggesting minimising pesticide se, he cited Indonesia, which banned 0 pesticides and reduced their use in ce cultivation without loss on produc- on.

IRRI had banned all the pesiticides hat had been categorised as hazardous humans on its field trials, even though ome of them could be useful to the lants, Dr. Lampse said, adding that imilar steps should be taken in devel- ping countries. IRRI would initiate nternational level consortiums with rice rowing countries to tackle various pro- lems confronting rice cultivation as well as evolving methods for maximis- ng yields through emerging technolo- gies like genetic engineering, he said.

Our efforts should be aimed at mproving rice production drastically to reduce water, air and soil pollution. Today almost 75 per cent of fertilisers used in irrigated rice were converted into methane and carbon dioxide emis- sions.

HUMAN RACE FACING ENVIRON DISASTER

The human race is on a collision course with the environment and both could be destroyed, an International Conservation Conference in Australia was told.

"The signs of danger are everywhere, from the highest atmosphere to the ocean deeps and tropics to the poles", said Martin Holdgate, head of the World Conservation Union.

"The human race is on a collision course with the environment", he told delegates to the conference. "If we destroy nature we destroy ourselves", said Holdgate, citing damage to the earth's ozone layer, industrial pollution, over-use of agricultural chemicals, and a world population doubling to 10 billion by early next century.

Holdgate, a British zoologist and scientist specialising in the environment, called for an international code of ethics to stop destruction of the environment. This would include more concerted action by Governments to cut the output of chlorofluorocarbons, used in aerosol cans and refrigerators, which create the so-called "Greenhouse effect".

Gases such as carbon dioxide and methane trap heat in the upper atmosphere and destroy the ozone layer.

POLLUTION BUSTERS HEAD FOR THE EAST

Dire warnings have been given by Chris Patten, the UK Environment Secretary, that British exporters could lose out to foreign competitors in the race to capture overseas markets for pollution control equipment.

Britain is in danger of lagging behind in eastern Europe where the market for equipment to clean up the environmental devastation left by the communist regimes is estimated at about £8bn a year. The hesitancy is understandable. There is shortage of hard currency available to pay for contracts, and legal and commercial confusion during the transition to a free market will remain for some time.

Deals were previously concluded with State Trading Organisations but western businessmen are now faced with a variety of independent organisations and burgeoning companies. "It is no good relying on out of date information about these countries," says Max Hobbs, group marketing director of Insituform Services. "You have to get your willies on and go out there."

His company, which manufactures a new system for repairing pipelines, has already started to penetrate eastern Europe. At the International Environmental Engineering Exhibition in Brno, Czechoslovakia last month, Hobbs was swamped with enquiries.

The company has just repaired two pipelines under Vitava river in Prague which were causing pollution. Under the Insituform system a cylinder is inserted in the damaged pipe and expanded to provide a new lining. The company is now negotiating for a job on sewer pipes at Moscow State University.

Chris Salter, a Director of Just Water, a West Lothian company producing water purification equipment, was surprised at the interest shown in Czechoslovakia. On the first day at Brno he had 50 enquiries. He was interviewed on local radio and his product appeared on the TV news.

The extent of water pollution in Czechoslovakia was clear in Brno itself. Until two week ago residents of this heavily industrialised town were being warned not to drink the water without boiling it.

One of the main needs in eastern Europe is for pollution monitoring equipment. The technology is not avail-

able there for measuring pollution, let alone dealing with it. Openings exist for companies such as VG Instruments, a division of Fisons, which was at Brno with its selling agents Uni-Export Instruments. It provides a whole range of instruments for detecting toxic gas, minute quantities of lead or mercury, impurities in drinking water or applications for soil analysis.

It is not a market for fly-by-nights who come in to make a quick sale. Servicing of equipment is important and the company has service arms in Czechoslovakia and other countries of the region. The need to think long term is stressed by Jan Campbell, Chairman and Chief Executive of Campbell Concept of Weybridge, Surrey, which specialises in development and investment opportunities in eastern Europe.

Campbell is dealing with a project where the Czechs have developed technology for turning ash into artificial stones. The Czech sponsors are putting up half the money but need a further £100,000 from the West. The Czechs face vast environmental problems. Tall chimneys belch smoke from the sulphurous brown coal which causes acid rain.

In Northern Bohemia near the German frontier whole areas on forest had been badly damaged by acid rai Bedrich Moldan, Environment Minist for the Czech Republic exphasises th he would like British companies establish joint ventures with the Czech to tackle these problems.

Under the EC PHARE programm financial support for Poland and Hun gary is likely to be extended to Czech oslovakia and other eastern Europea states. It is also hoped to secure fund from the United States Seed (Suppor for Eastern European Democracy) pro gramme and from the World Bank. "We are now trying to solve problems tha were solved in Britain 50 years ago," says Moldan.

Biotechnology

ONSONTO RENEWS THRUST N VIRUS RESISTANT PLANTS

Following success in producing virus sistant tomato plants, Monsanto is anning to extend work into introduc- g viral resistance in peppers and cas- ava through genetic engineering.

The company is part financing a pro- ct in Mexico to make chillies and weet peppers viral resistant. Some esults are expected in the near future, nd Monsanto will have rights over the echnology once developed.

Monsanto's second involvement is ith a joint research project, combining rench, German and American teams, o provide genetic resistance into cas- ava plants against the African cassava nosaic virus, and the cassava common nosaic virus. These viruses reduce harvests by 10-30% and benefits of any viral resistant strain will be obvious.

ORAL CONTRACEPTIVE MARKET TO DOUBLE

Worldwide markets for oral contraceptives could double in the next three years, with the approval of hormonal contraceptives in Japan end-1991, and the opening up of markets in Eastern Europe and the Soviet Union.

Low dosage versions, will also give a boost to markets following their approval in U.S. markets, end-1991. The current $1.7 bil. market is led by Wyeth, Ortho, Schering and Organon. Schering has already announced a marketing agreement with Yamanouchi of Japan which will permit it access in this market. The company is also well placed to exploit the [East] German market.

NOVO REPORTS SUCCESS IN OSTEOPOROSIS THERAPY

Kliogest, Novo's hormonal product has been shown in long term clinical trials to significantly reduce the levels of low density cholesterol while leaving the levels of high density cholesterol unaffected. Bone mass also increased opening up possibilities in the treatment of osteoporosis, and to reduce the risk of cardiovascular disease.

US PATENT FOR PROMOTER SYSTEM

DNAP Plant Technology, New Jersey has been awarded a patent for a promoter system that permits enhanced expression of genes genetically introduced into plants.

The promoter is a DNA sequence that determines the amount of protein produced from a specific gene by regulating the conversion of DNA to RNA.

News from Japan

ISSHO IWAI PLANS 40,000-T MPORT OF AUSSIE ILMENITE S URGENT STEP

Nissho Iwai Corp., will strengthen upply of Australian ilmenite in Japan. As a step meeting the detection of igh-density radioactivity from Malay-ian ilmenite, this corporation will start he supply of 40,000 tons of ilmenite rom the Australian Cable Suns Group, vhich is now under its control, within his year.

At present the same group is push-ng its plan for twofold expansion of ilmenite production. Nissho Iwai, too, has established a policy of securing a lasting and stabilized supply for users at home in accordance with the same plan. Ilmenite, which is material for titanium dioxide, is imported mainly from Malaysia and Australia. At the titanium-dioxide plants and waste-disposal facilities at various places, however, high-density radioactivity has been detected, and it was discovered that the radioactivity had its origin in the ilmenite from Malaysia.

Since then, the titanium dioxide manufacturers in the country have suspended the use of ilmenite from Malaysia. However, demand for titanium dioxide continues to increase rapidly, due mainly to the increasing demand for paint and ink pigment. As a result, the situation has become strained for the manufacturers.

Towards the end of last year Nissho Iwai purchased RZ Mines Group and the Cable Suns Group which had been under the control of PIL of Australia. The latter group is engaged in the mining of titanium and zircon ore, and is turning out 250,000 tons of ilmenite a year. It supplies about 40,000 tons of ilmenite to Japan every year. Because of the recent case of radioactivity detection, it has hastily concluded a new contract to increase supply by 40,000 tons within this year. According to the present schedule, 20,000 tons will be allotted to three companies — including Teika — at first, and the remaining 20,000 tons will be imported towards the end of this year.

Radioactivity is at the level of 130 ppm, or far below the level of 500 ppm said to be less than one-half of the maximum allowable content. So, there is no problem at all, as far as radioactivity is concerned. At present the Cable Suns Group is pushing the Jangerdap project for twofold expansion of ilmenite production. This project will be carried out within several years from now, and annual output will increase to about 500,000 tons.

Nearly 90 per cent of the scheduled output has already been contracted for Nissho Iwai wants to supply the remaining amount of about 50,000 tons, which has not yet been contracted for, to manufacturers of titanium dioxide at home. This corporation is planning to stabilize the supply over a long period, while maintaining fair prices and high quality.

PHOSPHORIC-ACID MAKERS ADVISED TO STREAMLINE OPERATIONS

The Ministry of International Trade and Industry (MITI) applied in late August the Law on Temporary Measures to Facilitate Industrial Structural Adjustment to wet-process plants for phosphoric acid. In accordance with the special law, phosphoric-acid producers are scheduled to work out streamlining plans and team up with each other as the circumstances concerned demand.

The industry has already conducted its own structural reforms twice under the pressure of dull demand for fertilizer and growing imports of ammonium phosphate — a major outlet for wet-process phosphoric acid. The circumstances surrounding the industry, however, have deteriorated, further lowering the operation rate of wet-process phosphoric-acid plants. Imports of the product are continuing to rise; they came to 556,681 tons in fertilizer year 1989, up 10.8 per cent over the preceeding year.

Nissan Chemical suspended last June production of phosphoric-acid liquid. It is forecast that phosphoric acid imports will continue to increase from now on. MITI had been preparing to apply the law to the said production facilities from the summer of last year but it took time for it to agree with the Fair Trade Commission with regard to enforcement of the law.

IDEMITSU KICKS OFF PLASTICS MOLDING BUSINESS IN U.K.

Idemitsu Petrochemical Co. is launching into plastics operations in Europe in a team-up with Japanese and local firms. Showa Pla U.K. Ltd. — owned by Idemitsu Petrochemical and Showa Plastics Co. of Japan — recently completed a molding plant for polystyrene (PS), polypropylene and ABS resins in Staffold located near Birmingham, the U.K. and has begun to supply primary and secondary-processing products of these resins to Japanese manufacturers of household electrical appliances operating in Britain. Local demand for the products is growing mainly for use in large-sized color TVs.

The joint firm was established in September last year with Idemitsu Petrochemical owning 45 per cent and Showa Plastics, the rest. The latter is a major Japanese injection molder. With regard to supply of low-material resin, Idemitsu Petrochemical is implementing a plan for building a 50,000-t/y polystrene plant in Spain in mid-1992 partnership with Repsol Quimica affiliated with Spain's state-run oil firm Repsol. The resin concerned will be supplied to the British subsidiary.

Based on these operations, Idemitsu Petrochemical intends to branch out into

polycarbonate and polypropylene business in Europe with the 1992 EC integration in sight.

The company is intent on pushing ahead with plastics operations overseas. It is producing ethylene, styrene monomer and PS in Malaysia, PS and PC resins in Taiwan, PC in Brazil and PP compounds in North America.

ETHYLENE CAPACITY 5.65 M. T/Y THOUGH SHORTAGE CONTINUES

Japan's production capacity for ethylene as of the end of last August amounted to 5,653,000 tons a year, up 3% over the preceding year: it would reach 6,183,000 tons if producers skipped periodic plant repairs. This is shown in the results of a survey recently conducted by the Ministry of International Trade and Industry.

The product will be in somewhat tight supply this year if it is correct in estimating domestic ethylene demand and the plant operation rate concerned at 5,740,000 tons and 90 per cent, respectively.

On the other hand, however, the capacity is expected to come close to 6 million tons at the end of this year since Showa Denko, Tonen Petrochemical and Idemitsu Petrochemical are planning to build up their ethylene capacities.

In response to brisk demand for petrochemcial products, Japanese producers have scaled up their production capacitites through debottlenecking.

Ethylene producers, for example, have stepped up production by revamping their crackers: Idemitsu Petrochemical, up 79,000 t/y; Sanyo Ethylene, up 40,000 t/y and Mitsubishi Petrochemical, up 30,000 t/y, etc. Capacity build-up is seen for almost all other petrochemical products excluding acetaldehyde. (See table).

Production capacity for major petrochemical products
(1,000 t/y)

Products	At the end of August 1989	At the end of August 1990
Ethylene	5,490	5,653
Low-density polyethylene	1,709	1,878
(L-LDPE)	(346)	(388)
High-density polyethylene (incl. co-produced L-LDPE)	1,058	1,118
Polypropylene	1,691	1,965
Ethylene oxide	718	753
Styrene monomer	1,951	2,228
Polystyrene (GP, HP)	1,106	1,189
Acetaldehyde	487	485
Acrylonitrile	592	592
Synthetic rubber (solid)		
SBR	678	681
BR	257	260
IR	110	113

Ethylene Capacity
(1,000 t/y)

Company	At the end of Aug. 1989	At the end of August 1990	
		When plant repairs conducted	When plant repairs skipped
Idemitsu Petrochemical	552	631	698
Ukishima Petrochemicals	881	881	972
Osaka Petrochemical	332	337	372
Sanyo Ethylene	400	440	480
Showa Denko	584	584	632
Tosoh	377	377	409
Sumitomo Chemical	358	367	401
Tonen Sekiyukagaku	393	393	428
Maruzen Petrochemical	480	480	525
Mitsui Petrochemical	92	92	100
Mizushima Ethylene	400	400	442
Mitsubishi Petrochemical	642	672	723
Total	5,490	5,653	6,183

WASTE-RECYCLING PLANT TO BE CONSTRUCTED

Clean Japan Centre is scheduled to solicit applications for a new project aimed at building in the next fiscal ... a demonstration plant for waste recycling and assessing its performance. The project intended to recycle refuse and thereby ensure effective use of natural resources has the financial back-up of the Ministry of International Trade and

The corporation was established 15 ears ago by MITI and private sectors ith the aim of developing and spread- ng use of waste-recycling technology.

R&D FOR MACROMOLECULAR UPER-IONIC CONDUCTOR 'LANNED

A study group for macromolecular naterial having controlled molecular rrays has compiled an interim report laiming the importance of research imed at creating a macromolecular uperionic conductor by modifying onductive polymer using molecular rray-control technology. The study roup attached to the Association for Progress of New Chemistry has been conducting since the fall of last year feasibility studies on molecular array-controlled macromolecular material. It has begun to consider developing the said conductor as a national project.

As macromolecular ionic conductor is a solid material containing no solvent and enables ionic conduction as in solution. Research on the product has been rapidly progressing since 1973 when a paper on the high-level temperature dependence of the conductivity of polyethylene oxide containing inorganic salt was announced. A macromolecular ionic device is regarded as promising material capable of facilitating the replacement of wet-type ionic devices with dry-type ones.

PRICES FOR AROMATICS-BASED INTERMEDIATES SEEN BEING UPPED

Following Mitsui Toatsu Chemicals and Nippon Kayaku, Hodogaya Chemical also plans to raise prices for benzene/toluene-based chlorides by ¥25-50/kg. effective with November 1 shipments. The company has entered into price negotiations with users.

It attributes the planned price hike to soaring prices for aromatic products — staple raw material — and sharp increases in distribution/utility costs. It claims it must boost the price if it is to continue production activity and ensure a steady supply of the products.

Targeted products are p-dichlorobenzene, o-dichlorobenzene, benzyl chloride, 2-6 dichlorobenzyl chloride, 2-4 benzyl chloride, p-chlorotoluene, o-chlorotoluene, 2-4 dichlorotoluene and 2-6 dichlorotoluene. The company has already raised prices for aldehydes (benzaldehyde, p-chlorobenzaldehye and o-chlorobenzaldehyde).

Market prices for aromatics-based intermediates will be upped for certain, since the three major producers are moving towards raising them by all means. As a result, those for end products — dyes and pigments — will also be boosted.

PLASTIC RAW MATERIAL PRODUCTS OUTPUT IN JANUARY-JULY BRISK

Production of plastic raw materials and products has continued to be brisk. According to The Japan Plastics Industry Federation, production of plastic raw materials in the January-July period of this year registered 7,215,672 tons, up 6.6 per cent over the corresponding period of the previous year when the highest figure ever was marked. Production of plastic products came to 3,130,506, up 2.1 per cent over the same period of the previous year.

Regarding production of raw-material resin, melamine resin, polyethylene, EVA, polypropylene, polyamide and polycarbonate each increased by more than 10 per cent over the same period of the preceding year. In particular, an increase in thermoplastic resins apparently supported total production growth. Production of raw-material resin in July registered 1,054,426 tons, exceeding the 1 million-ton level again.

Production of plastic products has also remained favourable. Production in July came to 464,807 tons, up 3.3 per cent over the same month of the previous year. Combined production in the January-July period recorded a 2.1 per cent rise.

Looking at growth rates by product in the same period, film registered a 0.6 per cent gain (nonrigid up 0.3 per cent; rigid, up 5.4 per cent), folowed by sheet (up 5.9 per cent), plates (up 2.9 per cent), synthetic leather (up 5.7 per cent), pipes (unchanged), joints (up 3.3 per cent), machinery, equipment and accessories (up 5.3 per cent), daily needs and sundries (up 0.7 per cent), vessels (up 0.2 per cent), construction materials (up 0.5 per cent), foamed products (up 3.8 per cent) reinforced products (down 3.5 per cent) and other proudcts (up 3.4 per cent).

PRODUCTION OF CHLORINATED XYLENE SLATED: IHARA NIKKEI

Ihara Nikkei Chemical Industry Co. aims to commercialize inhouse-developed chlorinated xylene — the first products of its kind in the world — using a newly built plant having a production capacity of 100 t/m in terms of p-xylene dichloride. A potential application of the new product is functional high polymers.

Chlorinated xylene as well as chlorinated toluene will be the company's major production items. To date the firm has served as a supplier of chlorinated toluene for Kumiai Chemical Industry and the Ihara Chemical group.

SYNTHETIC DYES OUTPUT RISES SHARPLY IN 1990 1ST HALF

Production of synthetic dyes in the January-June period of 1990 came to 37,539 tons, up 7.7% over the same period of the previous year; sales, 35,954 tons, up 6.5%; and sales value, ¥57,200 million, up 9.3%; sales value thus exceeding sales volume in terms of

growth rate. These figures show a very favorable situation. This favorableness steams mainly from the fact that domestic sales rose 8.2% over the same period of the previous year thanks to the briskness of domestic dye processing, which tended to have a dark-color orientation bolstered by the popularity of 'earth colors'' seen from the beginning of this year, and the fact that exports, which had broken record highs for third consecutive year, still continue increasing.

Thus, amid favorable conditions, production of almost all items increased. In particular, two major items — dispersed and reactive dyes — showed sharp increase of 10.4 and 21.5%, respectively. The two items combined accounted for 49% of the total.

Exports in the January-July period of 1990 were favorable at 11,945 tons, up 3.2% over the corresponding period of the preceeding year. Record highs are likely to be set for the fourth consecutive year. Export value showed a marked increase of 16% over the same period of the previous year.

Exports to Southeast Asia, which have continued high growth, showed country-by-country changes as illustrated by the fact that those to Korea increased sharply by 19% over the same period of the preceeding year but those to Taiwan, Hong Kong and Thailand decreased by 6, 13 and 6%, respectively. Those to Indonesia, Singapore and the Philippines, though small in volume, showed 45, 43 and 14% gains, respectively, thus showing an upward trend.

Exports to Europe rose 11% in volume and 38% in value and Japanese manufacturers' policy of Europe-orientation thus became clear. The export ratio was 18% by volume and 21% by value.

Imports in the January-June period of 1990 registered 8,688 tons, a 8.2% drop, indicating that the growth trend seen up to the end of 1989 had come to an end. Imports from Europe took an overwhelmingly large share as usual. Their import volume accounted for 75% of the total and their value, 84%. Imports from Asia showed a sharp decrease of 15% from the same period of the previous year. In particular, those from Taiwan declined by 29%.

SULFURIC ACID OUTPUT, DELIVERIES DROP SLIGHTLY IN APRIL-AUGUST PERIOD

Sulfuric Acid Association of Japan recently issued a report on the supply-and-demand situation for sulfuric acid in the April-August period of 1990.

According to the report, production came to 2,774,000 tons (1.5% drop from same period of previous year) and deliveries, 2,804,000 tons (1.4% drop), thus both showing a slight decrease tendency. Production in August registered 549,000 tons, a drop of about 20,000 tons from the previous month. However, the production level in August is only surpassed by that in August last year and that in August 1983. It can thus be said to be on a considerably high level. Demand recorded 518,000 tons, of which domestic demand registered 474,000 tons. Domestic demand was less than 500,000 tons for the first time in 10 months.

Regarding details of the production, sulfuric acid produced from smelter gas came to 1,634,000 tons (down 1.3% from same period of preceeding year); followed by that produced from pyrites, 227,000 tons (up 1.3%); that produced from sulfur, 806,000 tons (down 1.1%); and other sources, 108,000 tons (down 12.2%). With regard to details of sulfuric acid produced from smelter gas, the mainstay of sulfuric-acid production, sulfuric acid produced as a result of copper smelting registered 1,138,000 tons (down 3.5%) and that produced as a result of zinc smelting, 496,000 tons (up 4.0%).

Deliveries of sulfuric acid for fertilizer use came to 551,000 tons (down 5.8%) and those of sulfuric acid for industrial use, 1,984,000 tons (up 3.2%), giving a total of 2,535,000 tons (up 1.1%). Thus sulfuric acid for industrial use did no better than before in offsetting the sluggishness of fertiliser demand.

Exports at 269,000 tons continued their decline (down 19.7%). Inventories in August rose by about 30,000 tons over the previous month to 189,000 tons due to several companies increasing their inventories in preparation for periodical plant repairs for slated September.

SHOWA DENKO BUILDING UP STYRENE-MALEIMIDE RESIN BUSINESS

Showa Denko K.K. intends to push forward styrene-maleimide resin operations in earnest: the product has high-level flame-retardant properties and strong thermal resistance and demand for it is expanding for use in parts of household electrical appliances.

The company is now exploiting markets for the resin using a 200-t/m semi-commercial plant at its Kawasaki factory. It envisages building a 5-6,0000-t/y commercial plant one or two years hence by remodelling the existing batch-process plant. The firm has been intent on building up styrene business. It has ensured a steady supply of styrene-monomer feedstock by consolidating its partnership with Nippon Steel Chemical and started operating last spring a 30,000-t/y pant for HI-grade polystyrene in a team-up with Sumitomo Chemical.

Start-up of the new plant has enabled Showa Denko to develop/produce special styrenic resins using the above mentioned batch-process plant.

For example, it has commercialized in house-developed acrylonitrile-chlorinated-polyethylene-styrene resin.

ITSUI PLANS PTA PRODUC-ON IN INDONESIA WITH PER-AMINA

Mitsui Petrochemical Industries Ltd. d Mitsui & Co. will set up a joint ven-re in Indonesia with two local firms produce purified terephthalic acid TA) for polyester fiber.

The joint company, PTA Indonesia, ill be capitalized at $50 million, of hich 50 per cent will be provided by litsui Petrochemical, 20 per cent litsui & Co., a Japanese trading giant,) per cent by the Indonesian state-wned petroleum and natural gas ining enterprise, Pertamina, and 10 per ent by Pertamina's sales arm, Hum-uss.

The new firm will start building a TA plant in Aceh, northern Sumatra, ext year. The plant will have an annual roduction capacity of 250,000 tons, nd will go into operation late in 1993. TA Indonesia will start construction vork on another plant with the same apacity at about the time the first plant tarts operation.

Of the first plant's output, 100,000 ons will be supplied each year to ndonesian users, and 150,000 tons to ther countries in Southeast Asia.

Sales in the first year are put at about ¥25 billion. PTA demand in Indonesia stands at roughly 220,000 tons a year: t is projected to amount to 500,000 tons a year in 1995.

Pertamina is operating a 150,000-t/y PTA plant using technology introduced from Mitsui Petrochemical. It intends to scale up the capacity to 225,000 tons a year next spring. The Indonesian firm is pushing ahead with a plan for build-ing aromatics plants (p-xylene, 335,000 t/y and benzene, 250,000 t/y). It will supply 170,000 tons a year of p-xylene feedstock to the planned joint venture.

New Developments from Japan

AW MATERIAL FOR BIODE-RADABLE PLASTICS SYNTHE-ZED

Nard Institute, Ltd. developed new chnology for producing hydroxybutyric acid — raw material r biodegradable plastics — from ace-cetic methyl — a common chemical oduct — using inhouse-developed aney nickel catalysts. Acetacetic ethyl is so inexpensive that the new ocess is capable of producing the rget material at low cost.

A technical expert at the institute aims: "We are able to supply -hydroxybutyric acid monomer at 1,-2,000 ($7.9-15.8)/kg. "It is possi-le to produce a wide variety of bio-egradable plastics by copolymerizing ne monomer with methyl/ethyl/propyl roups. They will probably be priced elow ¥4,000 ($31.6)/kg.

ICI (U.K.) is the only firm in the orld to commercialize biodegradable lastics by copolymerizing -hydroxybutyric acid obtained from icroorganisms with the ethyl group. he natural raw material, however, oosts market prices for the product to pproximately ¥5,000 ($39.5/kg).

There is a chemical-synthesis process lesigned to produce 3-hydroxybutyric cid by reducing β-naphthol using uthenium catalysts. This process is, owever, unsuitable for mass produc-ion since the catalysts are so expensive. Nard has pioneered the said catalyst by emoving impurities from ordinary Raney nickel catalysts through ultra-onic cleaning and chemically modify-ng the resultant product using tartaric cid in a bid to improve its activity.

The purity of 3-hydroxybutyric acid produced using the Nard process stands at roughly 80%, slightly lower than that of biological products. It is still not therefrom is completely biodegradable but the process has paved the way for chemically synthesizing the raw material for biodegradable plastics.

TAIHEI CHEMICAL UNVEILS WHITE ANTICORROSION PIGMENT

Utilizing its expertise in producing secondary products of phosporic acid, Taihei Chemical Industrial Co. has formulated a white anticorrosion pigment based on calcium phosphite, and recently begun shipping samples. The new product is reportedly 3-4 times more weather-resistant than conventional white pigments. According to the company, the new pigment was developed as an undercoating substitute for environmentally hazardous chromium substances. As such, it is raising expectations that demand will increase over a wide range of applications.

Taihei Chemical is developing its businesses around the three lines of activated carbon, dental materials, and phosphoric-acid secondary products. Of these, the secondary products account for 75% of the total sales. The company has expanded its base of operations in this field by moving into bioceramics and compound materials for resins, and the recent pigment development is an additional step in this direction.

The white pigment is based on calcium phosphite, which Taihei has been supplying for other applications. The anticorrosion function is obtained by applying an independently formulated process to calcium phosphite and using the deoxidizing capacity of phosphorous acid.

KYOCERA UNVEILS LIGHT-WEIGHT SILICON NITRIDE INTAKE-EXHAUST VALVES

Kyocera Corp. has recently developed silicon nitride intake-exhaust valves for automobile engines and at the same time formulated a new technology for reducing weight.

Compared with existing silicon nitride used in turbocharger rotors, which Kyocera began supplying in quantity to Toyota Motor Corp. this August, the new material has superior flexural strength and abrasion resistance.

Traditional engine intake-exhaust valves are constructed of heat-resistant steel. But their usage has been restricted to below 7,000 rpm due to severe engine knock above this level. The new ceramic valves, on the other hand, can withstand more than 9,000 rpm, and at a 50% reduction in weight.

So far, Kyocera's new valve has won praise on the racing circuit. The next step is to expand sample shipments to passenger car makers, and with a good evaluation by users, begin commercial production.

OXYGEN ATOMS IN CERAMICS DIRECTLY OBSERVED

National Institute for Research on Inorganic Materials has succeeded for the first time in the world in directly observing oxygen atoms incorporated in ceramic material using a high-performance electronic microscope. The technical breakthrough will, the institute claims, be of great help in elucidating the crystalline structure of oxide-based superconductors.

The microscope was manufactured by Hitachi Ltd. in line with a research project for superconductive material, which is being tackled by Japan's Science and Technology Agency. The device's resolving power and accelerating voltage are 1A and 1,300 KV, respectively: the corresponding values for conventional equipment are 1.6A and 1,000 KV, respectively. The former's magnification is 1.5 million times. Lanthanum hexaboride has been employed for its electron gun.

The abovementioned ceramic material is zirconia (ZrO_2) whose crystalline structure is comparatively simple, thus facilitating oxygen observation. Zirconia is employed as an ionic conductor for an auto-exhaust sensor.

NEW-TYPE SECONDARY CELL FOR LOAD CONDITIONER UNDER DEVELOPMENT

Central Research Institute of Electric Power Industry is pushing forward with development of a new-type lithium cell that may have market potential as the secondary cell of a power-storage load conditioner for household use. The cell has a polyacenic semiconductor (PAS) as the cathode, A load conditioner is a device storing electricity late at night when electricity is not used as much as in the daytime and for discharging it at a time when the power load is high. The device mainly consists of the secondary cell, the AC-to-DC converter and the controller. Successful development of a suitable load conditioner depends on the development of a secondary cell featuring a high degree of both volume and weight energy density as well as a long cycle life.

According to the institute, the average discharge voltage of the Li-PAS cell within an operating range of 4-2 v measures 2.88 v, volume energy density reaches 120 W/h per litre and weight energy density, 70 W/h per kg — these are slightly higher than the target figures for a load conditioner-use cell. In addition, its energy efficiency reachers 93%, far higher than the initially set target of 80%. In particular, it is noticeable, the institute says, that the new cell has proved to have sufficient capacity for overcharge and overdischarge.

Even so, its cycle life is between 200 and 500 cycles, far below the target of 2,500. As it is known that the life cycle of the cell is dependent on the metallic lithium used as the anode, the institute says it will continue R&D efforts with emphasis placed on searching for substances to replace the lithium. PAS was originally developed by Kaneno, Ltd and Kyoto University. offered PAS by Kanebo for research, the institute has carried out since four years ago R&D for it for use as the cathode of secondary cell.

CONVERSION OF NATURAL GAS INTO ETHYLENE POSSIBLE

Three corporations are likely to successfully develop a new process aimed at producing ethylene from methane on the strength of an oxygen-coupling reaction. Lithium, magnesia and samarium are candidate carriers for catalysts used for the reaction.

The three are Japan National Oil Corp., Cosmo Research Institute and Japan Petroleum Exploration Co. They have inaugurated this fiscal year a new project intended to facilitate efficient use of natural gas.

MARKET INFORMATION

MEK Zooms, Phthalic Up

Prices of methyl ethyl ketone MEK) in the Bombay chemicals arket shot up to Rs. 90 during the eek under review. Phthalic anhyide also went up to Rs. 58/kg. With tle material in the market, prices of EK touched an all time high of Rs. 0. Cetex Petrochemicals, a major roducer, had reportedly shut down ue to unavailability of raw materials. The plant has since begun production and prices are expected to stabilise in the coming weeks around earlier levels. Phthalic anhydride saw an increase of Rs. 10 per kg with poor arrival of imported material. Dye intermediates were stable with good availablity of imported material. Other prices prevailed around the previous weeks levels.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on December 4, 1990)

INDUSTRIAL CHEMICALS	Per Kg.
mmonium sulphate	2.50
mmonium phosphate (Mono)	16.00
mmonium phosphate (Di)	16.00
mmonium carbonate (Di)	17.00
mmonium bicarbonate	6.00
mmonium chloride	4.00
mmonium nitrate	6.50
rsenic white powder	22+ST
crylamide (Resale)	82.00
Barium carbonate	18.00
Bleaching powder (33% Cl)	5.00
Borax (Granular)	17.00
Borax (Powder)	24.00
Boric acid (Tech)	45.00
Bisphenol-A	75.00
Butyl carbitol	106.00
Caustic soda (Flakes)	12.60
Caustic soda (Solid)	12.00
Caustic soda (Lye)	11.50
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	62.00
Camphor (Indian)	107.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	44.00
Copper sulphate	25.00
Chromic acid	70.00
Ethylene urea	65.00
Ferric chloride (Lumps)	9.00
Ferric chloride (Anhydrous)	20.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	135.00
Hydro	45.00

Hyflosupercell	29.00
Hexamine (Resale)	37.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone	34.00
Magnesium chloride (Crystal)	2.75
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	10,800.00
Nickel chloride	110.00
Oxalic acid (Resale)	14.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	28.00
Potassium carbonate (Imported)	32.00
Potassium bichromate	42.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	93.00
Polyvinyl alcohol (No. 173)	150.00
Polyvinyl alcohol (No. 208)	170.00
Paraformaldehyde (Resale)	22.50
Phthalic anhydride (Resale)	58.00
Pentaerythritol (Resale)	52.00
Paraffin wax	25+ST
Rangolite (German)	96+ST
Rangolite (Czech,)	80.00
Rangolite (China)	75.00
Sodium sulphate (Fine)	3.75
Sodium sulphate (Coarse)	3.50
Sodium sulphide 50-52% (Flakes)	11.50+ST
Sodium sulphide 58-60% (Flakes) (TCL)	25.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg	1,300.00
Sodium chlorite 80% (Spain)	100+ST
Soda Ash (Tata)	5.50
Soda Ash (Birla)	5.50
Soda Ash (Imp.)	5.50
Sodium bicarbonate	7.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	450.00
Titanium Dioxide (Anatase)	60.00
Titanium Dioxide (Rutile – RCR_2)	95+ST
Tartaric acid	220.00
Trisodium phosphate	12.00
Thiourea	75.00
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	16.50
Acetic Anhydride (Resale)	37.00
Acetone (Resale)	25.00
Adipic Acid	90.00
Aceto Acetanilide	72.00
Aniline Oil (HOC)	44.00
Benzoate Plasticiser	62.00
Butyl Acrylate	85.00
Butyl stearate	38.00
Butanol	34.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	27.00
Bromine Liquid	68.00
Chloroform	30.00
Carbon Tetrachloride	20.00
Cellosolve	65.00
Cyclohexanone	64.00
Cyclohexanol	58+ST
Diacetone (Resale)	26.75
Diethyl Oxalate	34.00
Diethyl glycol (DEG) (Resale)	38.00
Dioctyl Phthalate	62.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	22.50
Ethyl Acrylate	70.00
Ethylene Dichloride	18.00
Ethylene Glycol	36.00
Formic Acid (Imp.)	24.00
Formaldehyde (Resale)	7.25
Glycerine (CP)	48.00
Glycerine (IW)	55.00
Hydrogen Peroxide 50% (Resale)	34.00
Isopropyl Alcohol	38.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	105.00
Melamine	60.00
Methyl Ethyl Ketone	90.00
Methyl Isobutyl Ketone	42.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	21.00

Carbitol	75.00 + ST
Meta Cresol	45.00
Nitrobenzene	22.00
Nitric Acid (Conc.) (RCF)	2.50
Octanol	52.00
Ortho Cresol	30+ST
Phenol (Resale)	44.00
Propylene Glycol	54.00
Polyethylene Glycol (No.200)	75.00
Polyethylene Glycol (No.400)	75.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	95.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	120.00
Styrene Monomer	50.00
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	26.00
Triethanolamine (Resale)	95.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	55.00

SOLVENTS	Per Litre
Benzene	14.50
N-Heptane	10.50
N-Hexane	11.00
Methanol	9.25
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	16.00
Xylene	31.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)	
Alphanaphthylamine	65.00
Alpha Naphthol (Imp.)	170.00
Aceto Acetic Ester (Methyl)	90.00
Ammonium Molybdate	250.00
Anthraquinone	155.00
Anthranilic Acid	100.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	330.00
Beta Naphthol (Atul)	60.00
Benzidine Dihydrochloride (BDH)	90.00
Bromamine Acid	540.00
BON Acid (Incl. of excise)	150.00
Chicago Acid (Atul)	340.00
Coach Acid	58.00
C. Acid (Imp.)	195.00
Cyanuric Chloride	156.00
2,4- DNCB	33.00
Dihydrothio PTOS (Imp.)	1,600.00
Dimethyl Aniline	64.00
Diethyl Aniline	125.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB	215.00
Gamma Acid (Atul)	165.00
Gamma Acid (Local)	140.00
H. Acid (Atul)	135.00
G. Salt	60.00
J. Acid	330.00
J. Acid Urea	460.00
K. Acid	105.00
MPDS (German)	190.00
MNA	120.00
Meta Ureido Aniline	175.00
MPD (Local)	185.00
MPD (German)	190.00
Naphthenic Acid	46.00
N-Methyl J. Acid	510.00
N-Methyl Aniline	125.00
Naphthalene (Refined)	24.00
Ortho Anisidine (OA) (Imp.)	120.00
Ortho Dichloro Benzene (ODCB)	18.00
OT Base	145.00
Para Dichloro Benzene (PDCB)	29.00
Para Anisidine (PA local)	145.00
PNA	110.00
Para Cresidine (Imp.)	325.00
Para Amino Azo Benzene (India)	135.00
PNCB (HOC)	56.00
Para Amino Acetanilide	195.00
1-Phenyl 3-Methyl 5-Pyrazolone	142.00
Phenyl J. Acid	360.00
Para Amino Benzoic Acid	125.00
PT Base	133.00
Rhoduline Acid	550.00
Resist Salt 80%	30.00
Resorcinol	285.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	100.00
Sulphanilic Acid	35.00
Sulpho Tobias Acid	140.00
Trichloro Benzene (TCB)	28.00
Tobias Acid (Imp.)	130.00
Metanilic Acid	42.00
MTD (German)	130.00

Bombay Drugs Market

(Prices as on December 4, 1990)

Product	Rs./kg.	Product	Rs./kg.	Product	Rs./kg.
Acriflavine DPC	850.00	Disodium Hydrogen Citrate	43.00	Niacin	220 00
Aluminium Hydroxide IP	45.00	Ephedrine HCL	1850 00	Niacinamide	250 00
Ampicillin Trihydrate	1800.00	Erythromycin Estolate	2350.00	Nifedipine	1100 00
Aminophylline	360.00	Erythromycin Stearate	2150.00	Nitrofurazole	280.00
Albendazole	2100.00	Ethambutol IP	875 00	Oxyphenbutazone	775.00
Analgin	280.00	Ethophylline	650.00	Papaverine HCl	2000 00
Aspirin IP	90.00	Ferrous Fumarate	41.00	Paracetamol	180.00
Atenolol	2900.00	Folic Acid IP	2800.00	Pectin IP	425.00
Benzoic Acid IP	34.00	Furosemide IP	2200.00	Pepsin 1:3000	375.00
Bromine	67.00	Furazolidone IP	385.00	Phenbarbitone	510.00
Bromhexine HCL	2400	Guanidine Nitrate	40.00	Pheniramine Maleate	1250.00
Butylated Hydroxy Toluene	650.00	Gallic Acid	320.00	Phenyl Butazone USP	550.00
Caffeine Citrate IP	390.00	Haloperidone	19,000.00	Piperazine Citrate	100.00
Caffeine IP	410.00	Hematropine Methyl Bromide	12.00	Piperazine Hexahydrate	95.00
Calcium Gluconate IP	45.00	Hydrazine Hydrate	92.00	Potato Starch	65.00
Calcium Glycerophosphate	160.00	Ibuprofen IP	365.00	Propanolol HCL	1100 00
Calcium Lactate	40.00	Indomethazine	850.00	Pseudoephedrine HCL	2200 00
Calcium Phenthonate	700.00	I.N.H.	270 00	Pyrazinamide	1200 00
Cetrimide IP	210.00	Inosite IP	900.00	Ranitidine	2800.00
Chloramphenicol Powder	1900.00	Iodochloro Hydroxyquinoline	525.00	Rifampicin IP	3900.00
Chlorbutol	95.00	Lactose IP	40.00	Saccharine Sodium	215.00
Chlorhexidine Gluconate 20% BP	225.00	Lactic Acid	90.00	Salbutamol Sulphate	7300 00
Chloroquin Phosphate	850.00	Levamisole	1525.00	Sodium Iodide	425.00
Chlorpromazine HCL	1500.00	Lignocaine HCl	350.00	Sodium Methoxide	105.00
Choline Chloride FG	35.00	Lignocaine Base	350.00	Sorbitol Powder	115.00
Choline Chloride IP	58.00	L. Lysine Feed	95.00	Sorbitol USP	15.00
Cloxacillin Sodium	2300.00	L. Lysine Pharma	300.00	Sulphacetamide	300 00
Cimetidine	2100.00	Magnesium Hydroxide	30.00	Sulphamethoxazole	335 00
Citric Acid IP	45.00	Magnesium Trisilicate IP	12.00	Tinidazole	375.00
C.P. Maleate	1050.00	Mannitol USP	105.00	Theophylline Anhydrous	370 00
Cyproheptadine Tcl	9500.00	Mebendazole	610.00	Thiacetazone	290.00
Diazepam	800.00	Mercurochrome NF	280.00	Tolbutamide	200 00
Dicyclomine Hcl	1500.00	Methyl Chloroformate	85.00	Trimethoprim IP	1050 00
Diethyl Carbamazine Citrate	300.00	Metochlopromide TCL	2200.00	Vitamin A Palmitate	3100.00
Di-iodohydroxyquinoline	525.00	Metronidazole IP	450.00	Vitamin B6 Hydrochloride	1450.00
Diloxanide Fumarate IP	580.00	Morpholine	115.00	Vitamin B2 5-Phosphate	4100.00
Diphenhydramine HCL	260.00				

Bombay Dyes Market

(Prices as on December 4, 1990)

ACID COLOURS	Per Kg.
cid Violet 4BS	*190.00
cid Maroon V	110.00
cid Orange II	112.55
cid Orange IIY	93.85
cid Red A	137.00
cid Scarlet 3R	128.35
cid Red 38N	*195.00
cid Red R2R	132.00
cid Red RS	88.00
cid Patent Blue AS	*280.00
cid Green V	*375.00
cid Coomasi Blue	200.00
cid Yellow 5GN	65.00
cid Red PG	85.00
cid Red GRS	78.00
cid Black 10 BX	157.15
cid Black BX	126.95
cid Black Wax	135.50
rosein Scarlet MOO	200.30
rocinil Yellow GS (ICI, UK)	265.00
rocinil Red GS (ICI, UK)	530.00
rocinil Blue RS (ICI, UK)	315.00
rocinil Scarlet G (ICI, UK)	600.00
rocinil Orange G (ICI, UK)	250.00
rocinil Rubine (ICI, UK)	550.00

To get resale price add 6% tax.

IRECT COLOURS	Per Kg.
ellow 3GX	114.00
un Yellow RCH	175.85
ast Yellow GCH	171.50
ellow CFG Hly. Conc.	721.00
ast Yellow GS	126.96
ast Yellow CHRS	116.85
iscose Orange A	210.35
ast Orange GR	171.50
ed	122.65
ark Tan	98.15
ed IIR	98.15
ed 4B	217.55
ordeaux BW	170.10
ast Scarlet 4BS	223.50
ed 12B	220.45
ordeaux Hly. Conc.	249.20
otton Red N	117.05
rill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202 70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577 95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269 90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL'	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638 20
Scarlet RR	283.50
Rubine 3B	289 10
Rubine GB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128 40
Fast Scarlet R	198 05
Fast Scarlet RC	128 40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92 95
Fast Scarlet GG	77 75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115 75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223 35
Fast Red RL	251 20
Fast Red KB Oil	251 20
Fast Bordeaux GP	236 00
Fast Garnet GBC	103 05
Fast Violet B	548 80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379 10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60

ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65
Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	533.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: NOVEMBER 30: NNS Chatkolite suffered a setback of Rs. 6 at Rs. 66 per kg in the Delhi chemicals market during last week, following increased supply and lower advices from Bombay. In Bombay its prices slipped from Rs. 70 to Rs. 64. On withdrawal of demand from gur and khandsari manufacturers of U.P., sufolite suffered a setback of Rs. 7 at Rs. 71 per kg. Rangolite Germany was being offered lower at Rs. 100 against Rs. 105, in the absence of buying support. Sodium hydrosulphite kalali moved down from Rs. 52 to Rs. 51. Boric acid technical jumped down by Rs. 150 at Rs. 2,100 per 50 kg due to better supply. Borax and sodium nitrite fell sharply by Rs. 25/50 at Rs. 975 and Rs. 900/1,050. In the absence of demand from consumers, sodium sulphate DCM red marka dropped from Rs. 4,600 to Rs. 4,500 per tonne, whereas sodium sulphate Gwalior Rayon edged up by Rs. 50 at Rs. 4,150 due to paucity of supply. Titanium dioxide RC-822 declined from Rs. 85 to Rs. 84 per kg.

In the absence of supply from Bombay, coupled with rise in demand from consumers, citric acid Chinese jumped up by Rs. 50 at Rs. 2,300 per 50 kg. As a result of shortage of stock, mercury spurted by Rs. 200 at Rs. 11,000 per flask. Similarly ammonia bicarb rose from Rs. 190 to Rs. 195 per 25 kg owing to improved demand from bakeries. Caustic soda flakes jumped up by Rs. 15 at Rs. 580 per 50 kg in the wake of increased demand from stockists. Phosphoric acid shot up by Rs. 75 at Rs. 1,475 in view of dwindling supply. Potassium nitrate advanced sharply by Rs. 50/100 at Rs. 1,100/1,300 per quintal.

In the absence of fresh supply and tight stock, residue wax registered a marked rise of Rs. 500 at Rs. 6,000 per tonne. Likewise slack and match wax remained firm at Rs. 13,000 and Rs. 21,000 per tonne. On account of supply from U.P. and sustained demand from Bombay and Indore, menthol flake, medium and bold moved up by Rs. 5/10 at Rs. 285, Rs. 300 and Rs. 315. DMO and mentha oil quoted higher by Rs. 5/8 at Rs. 80 and Rs. 200 per kg respectively. Trading activities remained restricted in dyes and colours during the week and prices hovered around at their previous closing.

(DELHI MARKET RATES AS ON NOVEMBER 30, 1990)

Ammonia Bicarb (Per 25 Kg.)	195.00
Mercury (Per flask)	11,000.00
Soda ash (Per bag)	375/385.00
Ammonium Chloride (50 Kg.)	140/180.00
Caustic soda flakes (50 Kg.)	580.00
Citric acid (Per 50 Kg.)	2,300/2,450.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	101.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	91.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00
Sodium Bicarbonate (50 Kg.)	325/350.00
Sodium Hydrosulphite (Per Kg.)	46/51.00
Rangolite (Per Kg.)	100.00
Tartaric acid France (Per Kg.)	314.00
Sufolite (Per Kg.)	71.00
Chatkolite (Per Kg.)	66.00
DMO (per Kg.)	80.00
Boric acid Technical (Per 50 Kg.)	2,100.00
Paraffin Wax (Per 50 Kg.)	1,200.00
Slack wax (Per metric tonne)	13,000.00
Tartaric Acid (France Per Kg.)	314.00
Tartaric Acid (Swastik Per Kg.	210.00
Borax Granular (Per 50 Kg.)	975.00
Borax Crystal (Per 50 Kg.)	975.00
Sodium Nitrite (Per 50 Kg.)	900/1,050.00
Sodium Nitrate (Per 50 Kg.)	520.00
Camphor Thal (Per Kg.)	115.00
Camphor Powder (Per Kg.)	102.00
Menthol Bold (Per Kg.)	315.00
Menthol Medium (Per Kg.)	285.00
Menthol Flake (Per Kg.)	285.00
Mentha Oil (Per Kg.)	200.00
Glycerine (Per Kg.)	53/56.00
Sodium Silicate (Per quintal)	300/400.00
Hexamine (Per Kg.)	34.00
Acetic Acid Glacial (Per Kg.)	17.00
Copper Sulphate (Per quintal)	2,400/2,600
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	32.50/34.50
Calcium Carbonate (Per Tonne)	2,800/5,800
Acid Slurry Soft (Per Kg.)	42.00
Acid Slurry Hard (Per Kg.)	35.00
Phosphoric Acid (Per 50 Kg.)	1,475.00
Potassium Nitrate (Per quintal)	1,000/1,300.00
Potassium Permanganate (Per 50 Kg.)	2,600/3,000.00
Sodium Bichromate (Per 50 Kg.)	1,600.00
Trisodium Phosphate (50 Kg.)	700.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	63.00
Titanium Dioxide RC-822 (Per Kg.)	84.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	59.00
Titanium Dioxide RCR-2 (Per Kg.)	90.00
Zinc Oxide (Per Kg.)	46.00/50.00
Phenol Carbolic Acid (Per Kg.)	41.00
Carbon Tetrachloride (Per Kg.)	24.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	4,150/4,500.00
Naphthalene Balls (Per 50 Kg.)	1,500.00
Match Wax	21,000.00
Residue Wax	6,000.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/211.50
Naphthol ASG	180/249.70
Naphthol ASBS	210/260.75
Naphthol ASTR	300/378.92
Naphthol ASOL	210/250.90
Naphthol ASBO	195/274.30

DIRECT DYES	(Per Kg.)
Black E. Conc.	120/185.30
Diazo Black B.T.	105/154.50
Green B	90/147.55
Blue 2-B	60/107.00
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/248.20
Basic Auramine	55/110.00
Basic Rhodamine	315/425.00
Basic Methylene Blue	100/180.00
Basic Violet	165/210.00
Basic Malachite Green	185.00
Acid Orange	75/111.20
Congo Red H/C	85/120.95

Madras Market

Though prices quoted are marginally high, market lacked buoyancy. Arrival of goods from the northern centres were poor due to shortage of fuel.

Similarly goods were not going out also. MEK prices shot up due to poor availability. Phthalic anhydride prices came down on better availability. Though there is no change in price of caustic soda flakes, market information is that prices of these products might go up in the next week.

(MADRAS MARKET RATES AS ON DECEMBER 1, 1990)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate Iron free (per MT)	4,500.00
Ammonium Bicarbonate (per 25 kgs)	175.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	35.00
Barium Carbonate (per kg)	10.50
Barium Chloride (per kg)	9.50
Boric Acid Technical (per kg)	28.00
Bleaching Powder (per 50 kgs)	220.00
Borax (per 50 kgs)	815.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	11,500.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,500.00
Calcium Chloride 70% Solid (per MT)	3,500.00
Calcium Chloride Anhydrous (per MT)	6,000.00
Calcium Carbonate (Activated) (per MT)	6,600.00
Calcium Carbonate (Precipitated) (per MT)	5,800.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	25.00
Cresylic Acid 98-99% (per kg)	140.00
Pure Para Cresol 96% (per kg)	105.00
Meta Para Cresol 42% (per kg)	55.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	49.00
Hydrosulphite of Soda (TCPL) (per kg)	42.00
Hydrosulphite of Soda (IDI) (per kg)	45.00
Hydrosulphite of Soda (BASF) (per kg)	48.00
Hexamine (per kg)	35.00
Hyflosupercell (per kg)	30.00
Hydrogen Peroxide (per kg)	38.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	16.00
Magnesium Chloride (per kg)	4.00
Maleic Anhydride (per kg)	45.00
Menthol Crystals (per kg)	400.00
Oxalic Acid (per kg)	17.00
Paraffin Wax (per kg)	25.00
Potassium Bichromate (per kg)	40.00
Phosphoric Acid (per kg)	32.00
Polyvinyl Alcohol Powder (per kg)	150.00
Pentaerythritol (per kg)	55.00
Phthalic Anhydride (per kg)	50.00
Soda Ash (TAC) (per 75 kgs)	385.00
Soda Ash (TATA) (per 75 kgs)	410.00
Sodium Bicarbonate (TATA) (per 50 kgs)	395.00
Sodium Silicate (per MT)	4,000.00
Sodium Bichromate (per kg)	34.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	20.00
Sodium Sulphide Flakes (per kg)	20.00
Sodium Bisulphite (per kg)	8.00
Sodium Alginate (per kg)	400.00
Sodium Acetate (per kg)	8.00
Sodium Sulphate (Anhydrous) (per kg)	4.25
Titanium Dioxide (Anatase) (per kg)	65.00
Titanium Dioxide (Rutile) (per kg)	85.00
Trisodium Phosphate (per kg)	10.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	52.00
Zinc Chloride Powder (per kg)	14.00
Zinc Sulphate (per kg)	9.00

CALCUTTA MARKET (Prices as on Nov. 30, 1990)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	1,200.00
Camphor (per kg)	107.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	575.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	350.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

SOLVENTS

Acetone -- HOCL (per kg)	25.00
Butanol (per kg)	39.00
Butyl Acetate (per kg)	39.00
Benzene (per lit)	17.00
Cellosolve (per kg)	70.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	34.00
Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	20.00
Di-octyl Phthalate (per kg)	65.00
Di-N-butyl Phthalate (per kg)	65.00
Ethyl Acetate (per kg)	25.00
Isopropyl Alcohol (per kg)	34.00
Methanol (per kg)	12.00
Methylene Chloride (per kg)	22.00
Methyl Ethyl Ketone (per kg)	80.00
Methyl Isobutyl Ketone (per kg)	47.00
Phenol (per kg)	48.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	95.00
Trichloroethylene (per kg)	27.00
1-1-1 Trichloroethane (per kg)	29.50
Turpentine (per lit)	16.00
Toluene (per lit)	18.00
Xylene (per lit)	32.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt (5)
6/12	Ever Bridge (V-043)	Greenways	New York; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Almeida; Red Wood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations & Caribbean Ports. (Carting at G/H Cotton Depot).	13/12
11/12	Kapitan Kud	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 3).	14/12
11/12	Ocean Sincerity (V-29A/B)	O.S.A.	New York; Baltimore; Philadelphia; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma; & S. American & W. Indies Ports. (Carting at B. Pier Extn.).	19/12
11/12	Rhine Forest (V-118) (Lib)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	12/12
9/12	Vishva Parimal (Ind)	S.C.I.	New York; Baltimore; Savannah; Norfolk; Charleston; Houston; Jacksonville; New Orleans; Boston; P. Everglades. (Carting at B. Pier Extn. & Kalamboli Shed No. 4).	12/12
6/12	Ever Bridge (V-043) (Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & All Destinations in U.K.; Germany; Switzerland & Austria. (Carting at G/H Cotton Depot).	13/12
9/12	Vishva Parimal (Ind)	S.C.I.	P. Said; Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Helsinki; Copenhagen; Gothenburg & All Inland Destinations. (Carting at B. Pier Extn. & Kalamboli Shed No. 4).	12/12
11/12	Kapitan Kud (Rus)	Transocean/	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmao; Leeds. (Crtg. at T.P. No. 3).	14/12
		I.S.S. Co.	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven & Scandinavian Ports. Via Hamburg. (Carting at E-Grain Depot).	
11/12	K. Shev. kovskiy	Transocean	Odessa; Iliyichevsk; Havana; (Cuba); Genoa; Trieste; Piraeus; Marseilles; Barcelona; Varna; Bourgas. (Carting at Kalamboli).	13/12
11/12	Rhine Forest	M.S.P.L.	Assab. (Carting at P/Q-PD).	12/12
6/12	Ever Bridge	Greenways	Colombo. (Carting at G/H Cotton Depot).	13/12
11/12	K. Shev. kovskiy	Transocean	Afghanistan. (Carting at Kalamboli).	13/12
6/12	Ever Bridge (V-043) (Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at G/H Cotton Depot).	13/12
11/12	Ocean Sincerity (V-29A/B) (lib)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Shimizu; Keelung; Tsingtao; Qhindao; Xiangang; Shanghai. (Carting at B. Pier Extn.).	19/12
		M.S.P.L.	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Kaohsiung; Busan. (Carting at E-Shed Grain Depot).	
11/12	Rhine Forest	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	12/12
11/12	Ocean Sincerity	O.S.A.	Sydney; Melbourne; Adelaide; Brisbane; Fremantle; Auckland; Wellington; Lyttleton; P. Chalmers. (Carting at B. Pier Extn.).	19/12
12/12	Kap. Medvetskiy	Sai Ship	Mombasa; Dar Es Salaam. (Carting at E-Shed Grain Depot).	16/12

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
12/12	Asean Honour	Swanship	Malaysia
14/12	Contship Asia	Samrat/Hindustan/L. Triest	U.K. Cont. & Med.
12/12	Seacrest Achiever (V-223)	Seaspeed/Merzario/Penguin	U.K. Cont./U.S.A. & Gulf
15/12	Trans Globe	Swan Ship	Far East
22/12	Vishva Parijat	S.C.I.	U.K. Cont/U.S.A.
13/12	Vishva Navak	S.C.I.	Illyichevsk & Bandirma

Materials Imported/Exported

Imports values are c.i.f port. Export values are f.o.b. port

MATERIALS IMPORTED MADRAS
(From 1.8.90 To 8.8.90)
(continued from previous issue)

ALPHA PHENYL GLYCINE CHLORIDE: From Netherlands: SOL Pharmaceuticals Ltd., 2,150 Kgs., Rs. 8,00,648.

PHOSPHORIC ACID: From USA: MFL., 5,995.909 Mts., Rs. 4,04,13,264; From USA: Madras Fertilisers Ltd., 5,299.245 Mts., Rs. 3,58,61,479.

POTASSIUM CHLORIDE: From Canada: Std. Alkalies, 3,000 Mts., Rs. 78,50,211; Standards Industries Ltd., 2,550 Mts., Rs. 66,77,880.

PROPYLENE GLYCOL: From Japan: Jaynil Pharmaceuticals Pvt. Ltd., 32,340 Kgs., Rs. 5,53,646.

PYRIDINE: From Belgium: I.E.L. Ltd., 50,800 kgs., Rs. 35,84,376.

SODIUM ACID PYROPHOSPHATE: From Singapore: Asian Peroxide Ltd., 998 Kgs., Rs. 33,942.

SODIUM ALGINATE: From China: Jeelani Tanning Inds., 7,300 Kgs., Rs. 5,94,493.

SODIUM HYDRIDE: From FRG: Dr. Reddy's Labs Ltd., 1,000 Kgs., Rs. 3,87,894.

SODIUM METAL: From FRG: Shasun Drugs, 15,274 Kgs., Rs. 4,89,789; From Hungary: Standard Organics Ltd., 34,800 Kgs., Rs. 5,17,516.

SODIUM METHOXIDE: From FRG: Dr. Reddy's Labs., 9,000 Kgs., Rs. 4,90,429.

SODIUM NITRITE: From Hong Kong: Shasun Chemicals Pvt. Ltd., 40 Mts., Rs. 2,97,424.

SOYA LECITHIN: From Singapore: Nova Magnetics Ltd., 907.2 Kgs., Rs. 95,562.

STEARIC ACID: From Malaysia: Dunlop India Ltd., 22,000 Kgs., Rs. 2,14,216.

TETRAHYDROFURAN: From FRG: Curekraft Chemicals Pvt. Ltd., 8,960 Kgs., Rs. 2,06,815.

THIOUREA: From Japan: Shree Krishna Impex, 17,500 Kgs., Rs. 2,18,573.

TRICHLOROETHYLENE: From Japan: Kunal Engg. Co. Ltd., 33,060 Kgs., Rs. 3,99,166.

TRIMETHOXY BENZALDEHYDE: From China: Savera Labs Ltd., 1,000 Kgs., Rs. 4,07,107.

3,4,5, TRIMETHOXY BENZALDEHYDE: From Netherlands: Standard Organics Ltd., 5,205 Kgs., Rs. 23,21,333.

VANILLIN: From Switzerland: Sivasakthi Perfumery Works, 1,000 Kgs., Rs. 1,83,552; From USA: Bush Boake Allen India Ltd., 1,500 Kgs., Rs. 3,85,057.

VANILLIN TECH: From Norway: Dr. Reddy's Labs Ltd., 8,800 Kgs., Rs. 18,69,510.

VANILLIN USP: From France: Dr. Reddy's Labs Ltd., 9,000 Kgs., Rs. 22,54,575.

PLASTICS MATERIALS IMPORTED MADRAS
(From 1.8.90 to 8.8.90)

HDPE: From Japan: Myopcarl Sacks Pvt. Ltd., 15 Mts., Rs. 2,37,084; Polysack Inds., 10 Mts., Rs. 1,58,000; Priya Filament 15 Mts., Rs. 2,37,413; Super Polytex Pvt. Ltd., 30 Mts., Rs. 4,74,134; The Visakha Polypack Inds., 15 Mts., Rs. 2,37,670; From Singapore: Gunarani Trading Co., 20 Mts., Rs. 3,15,128; Integrated Exports, 6 Mts., Rs. 96,631; Integrated Exports, 6 Mts., Rs. 96,631; Inds. Chemicals & Plastics, 16.95 Mts., Rs. 2,55,067; 46.75 Mts., Rs. 6,63,330; Industrial Chemicals & Plastics, 15,75 Mts., Rs. 2,23,478; Industrial Chemicals & Plastics, 31.50 Mts., Rs. 4,46,956; Polyene General Inds. Ltd., 0.05 Mts., Rs. 1,000; R.N. Polysacks Pvt. Ltd., 7,857 Mts., Rs. 1,09,147; Samex Trading House Inds., 17 Mts., Rs. 2,46,792; Strofid Plastics Pvt. Ltd., 10 Mts., Rs. 1,57,564; Strofib Plastics Pvt. Ltd., 10 Mts., Rs. 1,57,564; Sun Polysacks Pvt. Ltd., 7.875 Mts., Rs. 1,09,147; Sun Polysacks Pvt. Ltd., 7,875 Mts., Rs. 1,09,147; From USA: Hindustan Cables Ltd., 84 Mts., Rs. 23,36,412; Shyam Textiles Pvt. Ltd., 35 Mts., Rs. 5,20,490.

LDPE: From Singapore: Victory Laminations, 15,000 Kgs., Rs. 2,39,417.

POLYETHYLENE: From Japan: Natraj Bags & Syn. Ltd., 20,000 Kgs., Rs. 3,30,796; Kamaragiri Electronics Ltd., 5,975 Kgs., Rs. 7,43,862.

POLYPROPYLENE: From Singapore: Hindustan Plastics Pvt. Ltd., 16 Mts., Rs. 2,32,274; From USA: Lakshmi Polypacks, 49.5 Mts., Rs. 7,99,643; From Singapore: Sri Narasimha Plastic Inds. Pvt. Ltd., 32 Mts. Rs. 4,47,216; Kunal Engg. Co. Ltd., 30 Mts., Rs. 4,46,136.

POLYSTYRENE: From Australia: M.M. Rubber Co. Ltd., 80 Mts. Rs. 14,87,116; From Korea: Beardsell Ltd., 17 Mts., Rs. 4,19,683.

MATERIALS IMPORTED BOMBAY
(From 4.6.90 To 5.6.90)

ACRYLAMIDE: From Japan: Arjyot Chemicals Pvt. Ltd., 15,000 Kgs., Rs. 3,92,657; East India Cotton Mfg. Co. Ltd., 1,000 Kgs., Rs. 26,177.

ADIPIC ACID: From FRG: Jain Enterprises, 16,000 Kgs., Rs. 3,62,989.

AEROSIL 200: From Belgium: K. Sevantilal & Co., 1,860 Kgs. Rs. 2,26,907.

ALDEHYDE C-8: From Japan: Industrial Perfumes Ltd., 1,232 Kgs., Rs. 1,50,250.

ALUMINIUM OXIDE: From FRG: Sureshchandra Agarwal & Co., 60,000 Kgs., Rs. 7,62,456.

AMINO ACIDS: From Japan: Wockhardt Ltd., 7,060 Kgs., Rs. 2,72,800.

2-AMINO-3-BROMO-5-NITRO BENZONITRILE 98%: From Japan: Sandoz (India) Ltd., 2,000 Kgs., Rs. 7,10,244.

ORTHO AMINO PHENOL: From Japan: Hindustan Ciba Geigy Ltd., 250 Kgs., Rs. 74,423.

AMINO THIOPHENOL: From USA: Cheminor Drugs Ltd., 5,215 Kgs., Rs. 17,59,533.

2-AMINO THIOPHENOL: From USA: Cheminor Drugs Ltd., 1,318 Kgs., Rs. 4,40,468.

ANISIC ALDEHYDE: From Japan: Grauer & Weil India Ltd., 1,125 Kgs., Rs. 18,84,750.

BENZYL SALICYLATE: From USA: New India Aeromatics Co. 453.6 Kgs., Rs. 36,809.

BISPHENOL-A: From Japan: Aroon Mills, 7,600 Kgs., Rs. 2,65,577.

1-BROMO-3-CHLORO PROPANE: From FRG: Hoechst India Ltd., 5,000 Kgs., Rs. 4,46,799.

BUTACHLOR TECH 94%: From USA: Omega Agro Pvt. Ltd., 34,920 Lbs., Rs. 6,90,453.

TERT. BUTYL HYDROQUINONE: From U.K.: Ahmed Comerbhoy Ahmed, 400 Kgs., Rs. 1,32,630.

PARA TERT BUTYL PHENOL: From Japan: Indian Plastics Ltd., 40,000 Kgs., Rs. 90,747.

DI-N-BUTYL TIN DICHLORIDE: From FRG: Gandhi Parekh Inv. Corp. Ltd., 1,000 Kgs., Rs. 1,39,275.

CAPROLACTAM: From USA: Garware Nylons Ltd., 1,25,000 Kgs., Rs. 33,81,210.

CARBON BLACK: From FRG: Asian Paints (India) Ltd., 600 Kgs., Rs. 1,11,929.

CARBON MONOXIDE: From UK: Instrumentation Ltd., 8 Nos. Rs. 25,820.

CATECHOL TECH: From UK: K.K. Poonja & Sons, 1,000 Kgs., Rs. 62,741.

PARACHLOROMETAXYLENOL BPC: From UK: Reckitt & Colman of India Ltd., 10,000 Kgs., Rs. 14,04,017.

PARA CHLORO TOLUENE: From USA: Gujarat Insectcides Ltd., 32,400 Lbs., Rs. 4,25,200.

CITRIC ACID MONO BP 80: From China: Bharat Lab. Suppliers, 10,000 Kgs., Rs. 1,26,522; From China: Neelraj Chemical, 20 Mts., Rs. 2,55,892.

2-CYANO PYRAZINE: From Japan: Artemis Pharmaceuticals Pvt. Ltd., 200 Kgs., Rs. 1,13,803.

3-CYANOPYRIDINE: From USA: Fine Organics, 4.8 Mts., Rs. 3,86,165.

CYCLOPROPYLAMINE: From FRG: Cipla Ltd., 300 Kgs., Rs. 3,96,478.

CYANURIC CHLORIDE: From FRG: Jay Chemical Inds., 2 Mts., Rs. 1,09,298.

DESMODUR: From FRG: Ishwar Arts, 18 Mts., Rs. 5,96,838.

4,4 DIAMINO DIPHENYL METHANE: From Japan: Dr. Beck & Co. (India) Ltd., 14,000 Kgs., Rs. 7,45,175.

DICHLOROAMINO DIPHENYL-ESTER: From France: Shidimo Interaux Pvt. Ltd., 1,200 Kgs., Rs. 2,84,166.

DICUMYL PEROXIDE: From Japan: Lakhani Rubber Udyog Ltd., 2,000 Kgs., Rs. 1,71,089; Universal Cables Ltd., 3,000 Kgs., Rs. 1,95,369.

2,6, DIETHYL ANILINE: From Taiwan: Hindustan Insecticides Ltd., 14 Mts., Rs. 6,62,106.

DIMETHYL UREA: From FRG: Luke Chemicals Pvt. Ltd., 13,500 Kgs., Rs. 3,44,752.

DIPHENYL OXIDE: From China: Hindustan Lever Ltd., 4,000 Kgs., Rs. 1,32,630.

EPICHLOROHYDRIN: From Japan: M.J. Exports Ltd., 11.76 Mts., Rs. 7,87,320.

ETHYL GLYCOL: From USA: R.K. Chemicals, 17.6 Mts., Rs. 3,45,538.

ETHYL HEXANOIC ACID: From Japan: Aryavart Chemicals Pvt. Ltd., 14.4 Mts., Rs. 2,28,710.

ETHYLTHIOETHANOL: From Belgium: Shaw Pharma, 2,200 Kgs., Rs. 92,143.

FORMAMIDE: From FRG: IDI Ltd., 10,120 Kgs., Rs. 2,67,490.

FURFURYL ALCOHOL: From Belgium: Tata Exports Ltd., 5,040 Kgs., Rs. 1,58,319.

GALLIC ACID 98%: From China: Zora Pharma India (I) Ltd., 5,000 Kgs., Rs. 5,32,268.

GAMMA PICOLINE: From Japan: Rajesh Chemical & Products, 4.94 Mts., Rs. 2,52,595.

GUM ROSIN: From China: Verb Chemical Inds., 36,000 Kgs., Rs. 2,95,278.

GUM ROSIN N GRADE: From China: Neelraj Chemicals, 18 Mts., Rs. 1,41,356; Paulson Paints Cellulose Works, 18 Mts., Rs. 16,17,750.

HELIOTROPIN: From Japan: Shree Sawaram Agarbathi Bhandar, 300 Kgs., Rs. 1,25,650.

HEXAMETHYL DISILAZANE: From FRG: Cepham Organics Ltd., 1,085 Kgs., Rs. 2,12,331.

HYDRAZINE HYDRATE: From USA: Kantilal Manilal & Co., 14,400 Kgs., Rs. 4,52,340.

3-HYDROXY QUINALDINE: From FRG: B.R. Inds., 933 Kgs., Rs. 4,19,280.

ISOBUTYL BENZENE: From China: Avik Pharmals. Pvt. Ltd., 15 Ltd., 3,060 Kgs., Rs. 1,85,163.

ISOPHORONE DIISOCYANATE: From FRG: VCM Polyurethanes Pvt. Ltd., 400 Kgs., Rs. 65,266.

MALONONITRILE: From Switzerland: IDPL, 1,400 Kgs., Rs. 6,06,198.

METHYL CHLORO FORMATE: From USA: Qure Drugs Pvt. Ltd., 14.343 Mts., Rs. 3,02,869.

METHYL HEPTENONE: From FRG: Boehringer Knoll Ltd., 525 Kgs., Rs. 88,064.

MONOETHYLENE GLYCOL: From Saudi Arabia: The Baroda Rayon Corpn., 250 Mts., Rs. 25,08,639.

MONOSODIUM GLUTAMATE: From France: R.K. Chemicals, 18 Mts., Rs. 3,28,261.

NEOPENTYL GLYCOL: From FRG: Suneeta Labs Ltd., 4,000 Kgs., Rs. 1,01,661.

OCTOIC ACID: From FRG: Kopran Chemical Co. Ltd., 6,105 Kgs., Rs. 1,34,436.

PARA OCTYL PHENOL: From Japan: Indian Plastics Ltd., 10 Mts., Rs. 2,35,594.

PERCHLORIC ACID: From FRG: BHEL Ltd., 12 Nos., Rs. 11,048.

D (-) ALPHA PHENYL GLYCINE CHLORIDE HCL: From Netherlands: Nikhil Drugs & Chemicals, 5,250 Kgs., Rs. 2,20,918.

POLYVINYL CHLORIDE: From Brazil: Monika Plastic Pipes Ltd., 48 Mts., Rs. 5,64,550; From Brazil: NOCIL, 400 Mts., Rs. 47,02,144; Prince Marketing, 125 Mts., Rs. 15,16,091.

PROPARGYL ALCOHOL: From FRG: S.D. Fine Chem Ltd., 570 Kgs., Rs. 78,228.

PROPYLENE GLYCOL TECH: From FRG: Bakelite Hylam Ltd., 34,480 Kgs., Rs. 5,44,287; From Japan:

Shree Venkatesh Chemi-colour, 16,170 Kgs., Rs. 2,87,833.

PROPYLENE GLYCOL USP: From USA: Hoechst India Ltd., 16,700 Kgs., Rs. 3,02,716; From FRG: Kanth Corpn., 17,200 Kgs., Rs. 3,24,263.

STANNOUS OCTATE: From Switzerland: Polyfoam, 300 Kgs., Rs. 50,280.

TERTIARY BUTANOL: From Japan: Asia Trade Enterprises, 3.875 Mts., Rs. 91,292; M.J. Exports Ltd., 3,875 Mts., Rs. 91,293.

TITANIUM DIOXIDE: From China: Shri Dye Chem Inds., 17,500 Kgs., Rs. 3,90,911; From FRG: Reliance Inds. Ltd., 35,000 Kgs., Rs. 17,04,130; From UK: Lakhani Footwear Ltd., 20 Mts., Rs. 8,48,133; Mascot Footcare, 10 Mts,, Rs. 44,850.

TITANIUM DIOXIDE: From USA: Asian Paints India Ltd., 28,000 Kgs., Rs. 12,50,917; Bankim Textiles & Chemicals, 18,144 Kgs., Rs. 8,23,260; Goodlass Nerolac Paints Ltd., 12,000 Kgs., Rs. 40,83,631; Star Oxides & Co. Ltd., 15 Mts., Rs. 6,80,605.

TITANIUM TETRACHLORIDE: From France: Sudarshan Chemical Inds., 5,120 Kgs., Rs. 1,54,456.

PARA TOLUIDINE META SULPHONIC ACID: From UK: Pidilite Inds. Ltd., 3,000 Kgs., Rs. 1,96,256.

TRIMETHYL PHOSPHATE: From USA: Gujarat Insecticides Ltd., 16,500 Kgs., Rs. 6,52,735.

DRUGS MATERIALS IMPORTED BOMBAY (From 4.6.90 To 5.6.90)

CHLOROZOXAZONE USP/JP: From Taiwan: Ethnor Ltd., 400 Kgs., Rs. 1,54,723.

ERYTHROMYCIN THIO CYANATE: From USA: Chemox Marketing Associates, 1,275 Kgs., Rs. 12,03,216.

FURAZOLIDONE BP 80: From China: Krishnalal Hiralal, 1,200 Kgs., Rs. 1,48,686.

LEVAMISOLE HCL BP 80: From China: Kantilal & Bros., 200 Kgs., Rs. 1,15,179.

MANNITOL IP/USP: From Brazil: Hindustan Ciba Geigy Ltd., 12,000 Kgs., Rs. 4,77,470.

MORPHOLINE: From USA: Bayer India Ltd.,, 30.04 Mts., Rs. 10,38,202; Polyolefin Inds. Ltd., 30.046 Mts., Rs. 10,17,229.

PYRIDOXINE HYDROCHORIDE USP: From Japan: Natwarlal & Co., 500 Kgs., Rs. 2,53,045.

SULPHADIAZINE BP 80: From China: Bhanu Trading Co., 475.5 Kgs., Rs. 1,08,833.

SULPHADIAZINE BP: From China: C.J. Shah & Co., 1,500 Kgs., Rs. 3,16,743.

THEOPHYLLINE ANHYDROUS BP: From China: Task Pharma Pvt. Ltd., 3 Mts., Rs. 4,97,365.

MATERIALS EXPORTED BOMBAY (From 19.3.90 To 28.3.90)

ACETOAMINO PHENYL B HYDROXY ETHYL SULFONE: To Keelung: Jay Chemical Inds., 3,000 Kgs., Rs. 2,60,000.

ACTIVATED ALUMINA: To Bangkok: Chemech Engineers, 600 Kgs., Rs. 2,77,677.

ALUMINIUM CHLORIDE ANHY.: To Felixstowe: Mangalam Inorganics Pvt. Ltd., 83,000 Kgs., Rs. 12,31,448.

ALUMINIUM HYDROXIDE GEL DRIED BP: To Mombasa: Industrial Trading Co., 1,200 Kgs., Rs. 45,500.

META AMINO PHENOL MIN. 99.5%: To Rotterdam: Organic Chem. Ltd., 5,000 Kgs., Rs. 9,69,052.

4 AMINOPHENYL B HYDROXY-ETHYL SULFURIC ACID: To Kobe: Jay Chemical Inds., 20,000 Kgs.

s. 17,17,000.

AMMONIUM CHLORIDE: To eddah: GB Exports Corpn., 1,250 Kgs., Rs. 8,750.

ANTHRANILIC ACID: To Mombasa: Suvidha Medical & General Stor. 2,100 Kgs., Rs. 2,07,319.

BENZYL BENZOATE IP: To Colombo: Ganesh Medicament Pvt. Ltd., 500 Kgs., Rs. 25,400.

BETAIONONE 92%: To Odessa: Seva Enterprises, 45,630 Kgs., Rs. 37,532.

BON ACID: To New York: Atul Products Ltd., 11,500 Kgs., Rs. 10,37,158.

CALCIUM HYDROCHLORIDE: To Jeddah: Grasim Inds. Ltd., 1,00,000 Kgs., Rs. 2,80,851.

CAPTAFOL TECH: To Busan: Rallis India Ltd., 15,000 Mts., Rs. 15,88,000.

MONOCHLORO ACETIC ACID: To Genoa: Ashok Organic Industries Ltd., 54,000 Kgs., Rs. 8,50,213.

CHLORO AMINO PHENOL SULFONIC ACID: To Kobe: Mahalaxmi Chemical 1882.20 Kgs., Rs. 2,02,819.

CHLORO AMINOPHENOL SULPHONIC ACID: To Tilbury: San Chem Enterprises, 3,700 Kgs., Rs. 5,66,000.

META CHLORO ANILINE: To Hamburg: Valiant Chemicals Corpn., 4,000 Kgs., Rs. 3,60,000.

PARA CHLORO BENZENE SULPHONAMIDE: To Felixstowe: Ushma Industries, 5,000 Kgs., Rs. 5,00,000.

COPPER SULPHATE: To Dubai: BB Exports, 5,000 Kgs., Rs. 1,20,000.

DICALCIUM PHOSPHATE: To Mombasa: R. Leiner & Sons Pvt. Ltd., 40,000 Kgs., Rs. 2,17,872; To Osaka: Nayankumar & Company, 60,000 Kgs., Rs. 3,11,487; To Yokohama: Nayankumar & Company, 60,000 Kgs., Rs. 2,91,068.

DICHLOROANILINE: To Felixstowe: Priya Elect. & Chem. Ltd., 1,080 Kgs., Rs. 67,704.

2,5 DICHLOROANILINE: To London: Sandoz (India) Ltd., 5,000 Kgs., Rs. 2,87,234.

ORTHO DICHLORO BENZENE: To Keelung: Nascent Chemicals Inds. Pvt. Ltd., 1,800 Kgs., Rs. 2,23,400.

2,5 DICHLORO SULFONIC ACID: To New York: Aarati Organics Pvt. Ltd., 1,500 Kgs., Rs. 1,60,000.

DIETHYL META AMINO PHENOL: To Piraeus: Navin Chem Enterprises 1,000 Kgs., Rs. 1,81,300.

DIETHYLENE TRIAMINE: To Antwerp: Diamines & Chemicals Ltd., 40,000 Kgs., Rs. 19,06,382.

DI NITRO ORTHO TOLUDINE: To Antwerp: Jai Organics Ltd., 7,500 Kgs., Rs. 11,13,685.

GAMMA ACID: To Keelung: Metro Chem. Industries, 5,481.5 kgs., Rs. 7,14,742; To Manchester: Associated Intl. & Chem. 1,087 Kgs., Rs. 1,51,000; To New York: Atul Products Ltd., 6,525 Kgs., Rs. 8,03,396; To Odessa: Sharda International, 67,589 Kgs., Rs. 80,30,518; To Piraeus: Metro-Chem India, 3253.60 Kgs., Rs. 4,11,915.

HEXA CHLOROETHANE: To Alexandria: Scottish Chem Inds., 20,000 Kgs., Rs. 3,41,276.

H-ACID: To Buenos Aires: Priya Electronics & Chemicals Ltd., 7,550 Kgs., Rs. 7,85,963; To Busan: Priya Electronics & Chemicals, 15,360 Kgs., Rs. 1,15,117; To Hamburg: Priya Electronics & Chemicals, 3,150 Kgs., Rs. 2,16,652; Vapi Product Inds., 6,350 Kgs., Rs. 5,20,000; To New York: Atul Products ltd., 10,150 Kgs., Rs. 7,79,388; To Odessa: Commar & Associates Pvt. Ltd., 62,000 Kgs; Rs. 50,77,800; To Felistowe: Sajan Impex Pvt. Ltd., 6,250 Kgs., Rs. 5,58,318.

IRON RED OXIDE: To Jeddah: Selective Minchem & Colour Inds.,

16,800 Kgs., Rs. 75,064.

ISO PROTURON TECH 95%: To Antwerp: Montari Indus. Ltd., 53,500 Kgs., Rs. 93,52,555.

K. ACID: To Kobe: Metro Chem Industries, 7,624 Kgs., Rs. 5,58,672.

K. ACID NAPHTHYLAMINE: To Bangkok: Vivid Exports, 2,915.45 Kgs., Rs. 2,00,281.

KOCH ACID: To Yokohoma: Jay Chemical Inds., 11,995.2 Kgs., Rs. 7;00,000.

MALEIC ANHYDRIDE: To Singapore: Adarsh Chemicals & Fertilisers 17,500 Kgs., Rs. 2,64,255.

MANGANESE DIOXIDE: To Keelung: Industrial Chemical Agencies, 1,26,000 Kgs., Rs. 7,16,936; To Manila: Selective Minchem & Colour Inds., 5,000 Kgs., Rs. 17.423.

MANGANESE DIOXIDE POWDER: To Keelung: Selective Chem Pvt. Ltd., 1,26,000 Kgs., Rs. 6,17,577; To Taiwan: Selective Chem Pvt. Ltd., 42,000 Kgs., Rs. 2,05,858.

MENTHOL CRYSTALS: To Hong Kong: Camphor & Allied Products Ltd., 3,420 Kgs., Rs. 10,07,149; To New York: Bhagat Impex Pvt. Ltd., 1,000 Kgs., Rs. 3,48,936; To Penang: Bhagat Fine Chemicals, 500 Kgs., Rs. 1,65,700.

MERCURIC CHLORIDE POWDER: To Izmir: United Phosphorus Ltd., 850 Kgs., Rs. 1,56,255.

METANILIC ACID: To Bangkok: Sudha Indl. Corpn., 3,060 Kgs., Rs. 1,22,553.

METANILIC ACID: To London: Sadhana Chem Ltd., 14,000 Kgs., Rs. 7,07,343; To Rotterdam: Jeevan Products, 14,000 Kgs., Rs. 6,99,468.

METANILIC ACID MIN 97%: To New York: Sadhana Nitro Chem Ltd., 18,000 Kgs., Rs. 7,97,840; To Rotterdam: Jeevan Products, 14,000 Kgs., Rs. 6,63,547.

META NITRO ANILINE: To Kobe: HOC Ltd., 10,204 Kgs., Rs. 8,32,727.

METHYL PARATHION: To Bangkok: Bayer India Ltd., 18,000 Kgs., Rs. 11,95,319.

METHYL PARATHION TECH 94%: To Manila: Bayer India Ltd., 18,000 Kgs., Rs. 1,36,52,553.

METHYLENE CHLORIDE: To Keelung: Gujarat Alkalies & Chemicals Ltd., 54,000 Kgs., Rs. 2,85,000.

METHYLENE CHLORIDE 99.9%: To Manila: Gujarat Alkalies & Chemicals Ltd., 54,000 Kgs., Rs. 4,17,000.

ALPHANAPHTHYLAMINE: To Manila: Priya Chemicals Ltd., 5,000 Kgs., Rs. 3,06,638.

NICOTINE SULPHATE: To Yokohama: Unitrust Nicotine Industries, 14,850 Kgs., Rs. 10,16,000; Urvakunj Nicotine Industries, 14,850 Kgs., Rs. 10,16,000.

NITRO 2 AMINO PHENOL SULPHONIC ACID: To Milan: Priya Electronics & Chemicals, 812.30 Kgs., Rs. 1,01,382.

NITRO BENZENE SODIUM SULPHONATE: To Kobe: Sameeraj India Ltd., 17 Mts., Rs. 4,28,255.

OXALIC ACID TECH: To Dubai: B.B. Exports, 20,000 Kgs., Rs. 3,30,000.

PHENYLBUTAZONE: To Hamburg: Nukem Chemical Inds., Ltd., 3,000 Kgs., Rs. 8,86,213.

D-ALPHA PHENYLGLYCINE: To Hong Kong: Armour Chemicals Ltd., 300 Kgs., Rs. 68,289.

PHOSPHOROUS TRICHLORIDE 98% Min: To Busan: Excel Inds. Ltd., 39,400 Kgs., Rs. 5;92,340.

POTASSIUM GUAIACOL SULPHONATE N.F.: To Hamburg: Synthokem 3,000 Kgs., Rs. 4,53,447.

POTASSIUM IODIDE USP: To Busan: G. Amphray Laboratories, 1,000 Kgs., Rs. 2,67,573.

BENZOYL PEROXIDE

We supply Excellent Quality
Quality Cautious Consumers for your Bulk Requirement

Contact Manufacturers

ROMA CHEM INDUSTRIES

Regd. Office: 22/1044, Punjabi Colony,
G.T.B. Nagar, Bombay 400 037.
Phones: 4073074/4092216/4093914 Resi: 483095

Sales Office: Municipal Bldg., C-1, Shop No. 2 & 3,
Near Sardar Nagar No. 4, G.T.B Nagar, Bombay 400 037.

Readily Available

BARIUM CHLORIDE

98%-100%

at

Rs. 11,500 per M.T. Basic

Please Contact the Manufacturers:

SANT CHEMICALS PVT. LTD.

77, New Bardan Lane, 2nd Floor, Vadgadi, BOMBAY - 400 003
Phones: 334568/324071; Resi: 6464380 Gram: WAHEGURU Telex: 11-75853 SANT IN
Our Associates: **CHAWLA & SONS**

SILICA GEL

(a) Indicative Type
(b) Non-Indicative Type
(c) Powder upto 400 Mesh
The product meet all Physical and Chemical analysis of imported Silica Gel

PRECIPITATED SILICA

of High Purity suitable to
(a) Rubber
(b) Pesticides
(c) etc.

Description	:	Almost colourless crystals
Silica as SiO_2	:	99.18% w/w
Iron as Fe_2O_3	:	0.025% w/w
Aluminium as Al_2O_3	:	0.025% w/w
Calcium as CaO	:	Negligible
Sodium as Na_2O	:	Negligible
Titanium as TiO_2	:	Negligible
Bulk Density	:	0.7407 gm.
Water Adsorption		
at 80% RH	:	36.85% w/w
at 60% RH	:	30.59% w/w
at 50% RH	:	29.00% w/w
at 40% RH	:	26.53% w/w
at 20% RH	:	22.87% w/w

HARCHEM

Factory: E-7(A) Road No. 1, Vishwakarma Ind Area, Jaipur-302 013. **Phone: 832865**
Bombay Office: 29, Merry Land, R.G. Thadani Marg, Worli, Bombay 400 018.
Ph: 4939641

Edited by R. Raghavan and published by N.R. Rajagopalan on behalf of owners, Sevak Publications, 306, Shri Hanuman Industrial Estate, Wadala, Bombay 400 031. Madras Office: Room No. 9, Wellingdon Estate, 3rd Floor, 24, Commander-in-Chief Road, Madras 600 105. Phone: C/o. 471659 and printed by N.R. Rajagopalan at Sevak Publications, 25, North

REGD. NO. TN/MS (C) 395 ISSN 0045/6500 R.N. NO. 1972/57